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Universities' Mission
to Central Africa.
WESTMINSTER, S. W.
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NOTES

ON

MALARIAL FEVERS.

"Then came—who knows?—some gust of jungle wind,
* * * * * * * *, a taint in the tank,"

The Light of Asia.

SIR EDWIN ARNOLD.

Universities' Mission
to Central Africa.
WESTMINSTER, S. W.
~~14, DELAHAY ST.,~~

NOTES
ON THE
MALARIAL FEVERS
MET WITH ON
THE RIVER NIGER (WEST AFRICA).

BY

W. H. CROSSE,

Principal Medical Officer,

ROYAL NIGER COMPANY, CHARTERED AND LIMITED.

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PREFACE.

Many of the following notes were written some two or three years ago while I was in West Africa, and were only intended for my own use. Since my return to Europe it has been suggested by the Government of the Niger Territories, that I should write a short account of malarial fevers, with special reference to those I have met with in West Africa.

The short book which I am now writing does not profess to give an exhaustive or detailed account of all the diseases caused by malaria; for a full account of these I refer the reader to the writings of Fayrer, Maclean, Hertz, Fagge and Pye-Smith, Bristowe, Laveran, Taylor and others.

As bearing on the subject of African Fever, I may mention the writings of Bérenger Féraud, Eyles, Easmon, Prout, Grant and Sternberg.

While I have been guided as much as possible by the descriptions given in the text books and have not hesitated to use them, I have tried to indicate the special points which I have personally noted; many matters of general interest have been omitted, the time at my disposal being very limited, as I shortly leave for Africa. At the same time, on certain points, which are possibly of no great importance to any but those living in Africa, special stress has been laid.

I have to thank Dr. Hale White and Dr. Washbourn, of Guy's Hospital, for much kindly advice and help.

I am greatly indebted to my friends Dr. Whittindale, Dr. Battersby and Dr. Smith, for notes of cases of fever which they have had under their care in West Africa.

Some matters treated of—especially those relating to houses, clothing, &c.—may seem to be superfluous or out of place; in explanation I have to say that they have been inserted at the request of some of my friends, who, living as they do in an uncivilized country, have in many instances no chance of obtaining medical advice.

In conclusion, I may say that I am sensible of the many defects in my book; yet, I hope, that in spite of these shortcomings, the reader will find that he has been helped in some small degree in his study of the much vexed question of African Fever.

W. H. CROSSE.

SURREY HOUSE,
LONDON, W.C.,
December, 1892.

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MALARIAL FEVER OR AGUE.*

Malarial Fevers have been known from the earliest times: they exist in many parts of the world, for instance, in certain districts of England, Africa, India, America, China, and have been described under a great variety of names, such as Marsh or Fen Fever, Roman Fever, African Fever, Bilious Remittent Fever, Bengal Fever, &c.

Malarial poisoning presents itself under two main forms, which are both met with in West Africa. (*a*) Remittent Fever, most commonly met with in the tropics, and usually more severe than Intermittent Fever. (*b*) Intermittent Fever, more commonly met with in temperate climates, but not uncommon in the tropics. Intermittent and Remittent fevers are due to the same cause; they closely resemble each other in their symptoms, though in typical cases they show some well marked differences; they are really two manifestations of the same disease, for one form may pass into the other, and in both similar treatment has to be adopted.

Persons living for any length of time in a malarious climate are likely to suffer from both forms of malarial poisoning.

Malaria.—By malaria is usually meant a miasm which is thought to be exhaled from certain soils and which is popularly considered to be the cause of malarial fever; but the actual cause of the malarial symptoms seems to be, the presence in the red blood corpuscles of an animal parasite, the plasmodium malariæ, which is received into the system through the air breathed, and also probably through food and liquid. This parasite was discovered by Laveran, and excellent plates are given in his book shewing it in its various stages of development.

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*The term ague is often reserved for the intermittent form of malarial fever.

The plasmodium malariæ consists of an organism similar to an amœba, and possessing similar movements. It often becomes pigmented, the pigment being derived from the destruction of the hæmoglobin of the blood corpuscle, this pigmentation enables us to recognise easily the plasmodium on examining the blood in the fresh state.

After a time the plasmodium divides up by a process of of segmentation into a number of spores which are set free and develope into amœboid bodies which again undergo the same cycle of changes. The plasmodia are generally found within the body of the red blood corpuscle, they are often however found free in the plasma and are then sometimes provided with flagellæ.

Attempts to cultivate the plasmodium malariæ have been made, and although no very definite results have been obtained, the inoculation of a healthy person from one having these microörganisms in his blood, is followed by an attack of malarial fever.

MALARIAL FEVER OR AGUE is an acute, specific, noneruptive fever, it is endemic and usually not epidemic, and is neither contagious nor infectious in the usual sense of the term. Unlike many other fevers, one attack does not protect against another. This fever is paroxysmal in character, and during each paroxysm, there are three more or less well defined stages, which are followed by a period either of remission, or of intermission.

INCUBATION.—The period of incubation is very difficult to determine, I believe that the average period is from three to six weeks; it is seldom longer than three months. In one case the patient assured me that his first attack did not take place till after he had been in West Africa a year, yet he had often been in the most unhealthy parts of country, frequently sleeping on board his steamer close to mangrove swamps; his first attack was of the severe remittent type.

Some Europeans have been attacked with fever almost directly they landed; it must be noted however, that for several days before reaching the Niger we have to travel near to a malarious coast.

The conditions necessary for the development of the plasmodium malariæ, are believed to be:—stagnant water; a porous surface soil; a warm temperature; and saturation of the soil to a certain extent. In all probability stagnant water is *the* most important of these.*

Among the conditions favouring the development of this organism may be mentioned:—

A tropical or sub-tropical climate with a heavy rainfall.

Low lying swampy ground with rank vegetation.

An undrained soil: a non-porous sub-soil.

Decomposing vegetable matter; and possibly also animal matter.

Certain seasons of the year, especially the hot season after the rains, when the rivers and inland lakes are falling and swamps are getting dried up.†

The upturning of virgin soil. ‡

In the higher regions where there is no rank vegetation or heavy rainfall, ague is often found, but in these places there is frequently a large amount of sub-soil water, together with a high temperature.

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* "But still, water seems to be the prime causal agent, if not on the surface, in the subsoil, especially when *stagnant* and near the surface." —*The Climate and Fevers of India*, page 39.—FAYRER.

† HERTZ writes—"Thus the most favourable conditions for the development of this poison are offered by marshes that have dried up, while their injurious influence is materially diminished as soon as heavy rains once more submerge the previously parched surface of the ground."—*Cyclopædia of the Practice of Medicine*, Vol. II., page 564. Von Ziemssen.

‡ See an interesting article by Dr. Prout on the relationship between certain meterological conditions and the incidence of malarial fevers. —*The Practitioner*, June, 1891.

As the above conditions obtain to a large extent in West Africa it is not surprising that malarial fevers are so common, nor that they at times assume a virulent type, nor that the severity and frequency of the fevers are proportionately greater where these conditions are most prevalent. Malarial fever exists all over the Niger territories, but it is of a less severe type where there is less vegetation and less swampy low lying ground, though in these places the temperature is higher than near the Niger delta.

Of the many causes predisposing to an attack of malarial fever only a few need be mentioned. They are :—

Residence in a malarious district.
Previous attacks of malarial fever.
Previous bad health.
An existing disease, *e.g.* dysentery.
Impure food and water.
Improper food.
Constipation.
Excess of any kind, especially :—
    Over exertion and fatigue.
    Excessive eating, especially of animal food.
    Alcoholic excess, especially in the case of spirits.
Sudden changes of temperature.
Want of fresh vegetables.
Bad sanitary arrangements.
Exposure to the direct rays of the sun.
Living in ill ventilated and draughty houses.
Chill.
Going out of doors between sunset and sunrise, during which time the malarial poison is said to be most active.

I give the following note as illustrating the effect of one of the above predisposing causes.

At a station some miles up the river a considerable and unusual fall of temperature was noted on two or three nights running. At this station there were five Europeans. They were all within a short time attacked by fever; two had slight febricula, and the other three had more or less severe fever.

Though clinically we feel certain that West African fevers are essentially the same as those met with in Rome, India and elsewhere, this can only be finally settled by microscopical examination of the blood of each patient, this is especially important in the case of Blackwater fever which has by some been held not to be malarial at all; and in all cases in which it is found to be difficult to diagnose malarial fever, from Yellow fever, Typhoid fever, Acute Yellow Atrophy of the liver and certain other complaints, such examination would be of the greatest assistance.

It have already stated that malarial fever presents itself under two forms, viz.: intermittent and remittent fever; occasionally the fever assumes what is called the continued type. It should be clearly understood what is meant by these three terms.

Dr. Frederick Taylor gives the following definition—

"A continuous fever is one in which the temperature is constantly above the normal, and the differences between the morning and evening temperatures never exceed the variation in health—that is, one and a half degree.

A remittent fever is also one in which the temperature is constantly above the normal, but the difference exceeds one and a half degree. Thus, in the morning it may fall two or three degrees, but never reaches the normal.

An intermittent pyrexia is one in which the morning temperature falls to the normal, or below it, while the evening rise is two, three, or more degrees above it.

In some cases of illness there may be, at one time, a continuous pyrexia, at another a remittent, and at a third time an intermittent pyrexia; as, for instance, in enteric fever and in phthisis."*

The course of the temperature in African fevers is very often irregular, typical temporature charts are rare, for one form of fever tends to change into another, and the type of a fever is greatly modified by the drugs used, the condition of the patient, the presence or absence of complications, &c., &c.

It may be taken as a general rule that all white people living in tropical Africa will suffer from fever, but it depends largely upon themselves and the conditions under which they are placed, how often they will have attacks of fever, and whether the attacks will be severe or otherwise; for example I know one case in which a patient while suffering from a mild remittent fever paid a visit during the heat of the day to some plantations; within two hours he was suffering from severe fever, which later on assumed the Blackwater type. The three varieties of malarial fever, viz.: intermittent fever, remittent fever and blackwater fever, will now be described in detail.

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* *The Practice of Medicine*, page 11.—Frederick Taylor.

INTERMITTENT FEVER.

It will be necessary to describe at some length the course of an attack of intermittent fever, before treating of the more common, and usually more severe[*] form called remittent fever, as the symptoms of remittent fever very much resemble those of intermittent fever.

The premonitory stage is of great importance to the medical man, for if the patient be treated at once, the attack may often be cut short almost immediately, at any rate the fever will, as a rule, be lessened in its severity.

The onset of the attack of fever is sometimes said to be sudden; I believe that this is very unusual, there being as far as I know, nearly always a well defined premonitory stage.

PREMONITORY STAGE.—*i.e.*, the time during which, though the patient's temperature keeps about normal, he suffers from general malaise. The duration of this stage is uncertain; usually it is about two hours, but it may be very much longer.

The attack is divided into the cold, hot, and sweating stages, and is followed by the stage of intermission.

COLD STAGE.—*i.e.* the time during which the patient's temperature rises, and during which he feels more or less cold.

The duration is uncertain, usually half to two hours; it is not commonly longer than three hours.

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[*] "Remission and intermission, however, are not to be regarded as absolute indications of degree of intensity, for a remittent may be comparatively mild, whilst an ague may become pernicious." *The Climate and Fevers of India*, page 61.—FAYRER.

Hot Stage.—*i.e.* the time during which the patient instead of feeling cold, feels more or less hot, and during which his temperature remains as high, or even becomes higher than it was at the end of the cold stage.

The duration is variable, usually about two or three hours.

Sweating Stage - *i.e.* the time during which the temperature is falling to normal, and in which there is moisture instead of dryness of the skin.

The duration is uncertain, usually two to four hours.

Sometimes the temperature does not begin to fall till the sweating has been established for an hour or more.

Stage of Intermission.—*i.e.* the time during which the temperature remains normal or subnormal, and in which the patient feels comparatively well, though he is usually somewhat exhausted.

After the paroxysm, the patient either becomes quite well, or begins, after a period of apyrexia, to be ill again, starting with a cold stage; which of these happens will depend greatly on the treatment which he has received, and that which is adopted during the favourable period of intermission. It must be understood that these stages glide into one another, it being often difficult to tell where one ends and another begins ; for instance, towards the end of the cold stage there may be alternately shivering and burning sensations ; towards the end of the hot stage the skin may be alternately dry and moist.

By the paroxysm is meant the time which elapses from the beginning of the rise of temperature to the time when it returns to normal; its duration is very variable, but is usually about 6 to 12 hours.

By the interval is meant the time which elapses between the onset of one cold stage and the onset of the next.

In the majority of cases, the tendency of the disease is to cure itself, and some patients refuse to take any medicine till after the malady has left them; but this is dangerous, for an ordinary intermittent may at any time become a severe remittent; and it is quite certain that treatment tends to cut short the disease, and therefore prevents prolonged engorgement of the abdominal viscera. In my own opinion, chronic enlargement of the spleen is becoming less common than formerly, owing to the active treatment cases of fever now receive. I believe the same remark applies to brow ague, and some other sequelæ of malarial fever.

Sometimes we have what is called "one day fever" —by this is meant that there is only one short paroxysm, after which the fever does not return. These cases are mild, and are properly spoken of as attacks of febricula; it is often doubtful whether the attack is due to malaria at all, at any rate these attacks are often cured without the use of quinine.

INTERMITTENT FEVER is divided into different classes; this division depends upon the length of the interval, *i.e.*, of the time which elapses from the beginning of the fever to the end of the intermission, that is, to the beginning of the next paroxysm.

QUOTIDIAN AGUE.—The interval is of 24 hours duration, *i.e.* there is an attack of fever each day.

TERTIAN AGUE.—The interval is of 48 hours duration, *i.e.* there is an attack of fever every other day. This form of fever is said to be most common in temperate climates.

QUARTAN AGUE.—The interval is of 72 hours duration, *i.e.* there is an attack of fever every fourth day. This form of fever is very rare in West Africa.

Many other varieties are described, such as :—

Double quotidian, in which there are two paroxysms each day.

Double tertian, in which there is an attack of fever every day: the attacks on the first, third and fifth days resemble each other, those on the second, fourth and sixth days also resemble each other in time of commencement, height of fever, &c., but the attacks on the odd days are unlike those which occur on the even days.

Double quartan, in which the patient has similar attacks on the first, fourth and seventh days, he has also similar attacks on the second, fifth and eighth days, but these two different attacks do not exactly resemble each other; this is not an irregular quotidian ague, for on the third, sixth and ninth days there is no fever at all.

Irregular quotidian ague is that form of daily fever in which a certain stage is missed altogether, or in which some stages are abnormally prolonged or shortened, or in which the paroxysms anticipate or postpone, and in which the form of the fever varies from day to day; double quotidian ague is sometimes called irregular quotidian ague.

"Sometimes the attacks of a quotidian fever are so prolonged that before the sweating stage of one fit is over the cold stage of the next one begins; the disease is then said to be *subintrant*." *

In quotidian ague, the paroxysms are said to last from 10 to 12 hours; in tertian, 6 to 8 hours; in quartan, 4 to 6 hours. The cold stage is said to be shortest in quotidian, longest in quartan ague.† The various forms of ague depend to a large extent on the patient's condition, the time of year, and the medical treatment adopted, &c.

The form of intermittent fever most commonly met with in West Africa, is of the irregular quotidian type.

The attack is said to anticipate when it is shorter in its interval than the 24, 48 or 72 hours; when the interval is longer the attack is said to postpone. The more the attack anticipates the worse it is, and the more it is liable to become of the remittent type; the more the return of the fever is delayed the better it is for the patient.

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* *Text-book of the Principles and Practice of Medicine*, Third edition, vol. I., page 326.—Fagge and Pye-Smith.

† *The Theory and Practice of Medicine*, Fourth edition, page 278.—Bristowe.

Premonitory Symptoms.—These are variable, sometimes slight, at other times well marked. The patient feels that he is going to be ill, he is languid and chilly, he may be inclined to vomit, is disinclined to take food, has slight heaviness or aching of the limbs, very often he suffers from tingling of the skin, he is especially inclined to yawn and stretch his limbs, he often has a dull headache, and is disinclined for work or pleasure. The temperature is found to be somewhere about normal; as soon as it begins to rise he will begin to feel decidedly cold, and then the cold stage has come on and the paroxysm has begun.

Sometimes these symptoms pass off of themselves, or they may be cut short if the patient has been put under treatment at once.

Cold Stage.—The temperature now begins to rise rapidly and usually reaches a point between 103 and 104; I have known it reach 108.

The pulse is small and rapid, and may be irregular; the respiration is quickened.

The patient instead of feeling general malaise now feels and knows that he is really ill. He has pains in the back and limbs, the slight chilliness has become a sensation of cold, which always begins in the back, and as the case progresses the coldness becomes greater, the patient shivers, and this shivering soon becomes intense and general, he feels as if iced water were being poured over him, his jaws chatter, his limbs are shaken, he cannot control the shivering, and the rigor is sometimes so severe that he can hardly keep in bed.

The feeling of cold makes him beg for blankets, hot water bottles and warm drinks.

The skin becomes dusky or ashy and passes into the condition known as "goose skin"; at the beginning it is very often cold to the touch, and the temperature in the axilla may at first be normal or subnormal, but taken in the rectum (if the shivering is severe it is not advisable to take it in the mouth) it is found to be rising.

There is complete loss of appetite, but the patient usually longs for hot liquids, which he frequently vomits at once.

The tongue is furred, broad, and tremulous, and there is often severe headache.

Frequently there is considerable discomfort about the region of the spleen due to its engorgement, and there may be pain on pressing over the liver and kidneys.

The bowels are usually constipated if a purgative has not been taken.

Generally the patient is acutely sensible, the least noise irritates him; occasionally he is dull and heavy. The temperature continues to rise to end of this stage. Urine is passed frequently and is increased in quantity, it is light in colour and often very irritating.

Hot Stage.—The hot stage comes on gradually. The shiverings become less severe and frequent. The patient begins to feel easier and as the feeling of warmth increases, the face becomes flushed and red, and the shrivelled appearance disappears. Tho temperature remains high or even increases. He soon becomes very hot, and intensely uncomfortable; the skin is burning and dry, the headache is severe, the sufferer begs for cooling drinks and asks to have his skin and head bathed with cold water. He is at times more or less delirious. The pulse and respiration both become quicker, the urine becomes scanty and high coloured.* Vomiting which may have been slight or absent in the first stage, may now become so severe that nothing can be kept down, the vomit being always bilious in colour.

This stage is said sometimes to be absent, I have never noticed such a case.

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* "Albumen in the urine, accompanied by casts and even by blood, has been observed by Griesinger and Hertz, but this is a very rare complication."—*Text-book of the Principles and Practice of Medicine.* Third edition, vol. I., page 325.—Fagge & Pye-Smith.

Sweating Stage.—The hot stage now gives way to the sweating stage, and the sooner this comes on the more favourable is the case.

Moisture is first noticed on the forehead and chest, and is followed in favourable cases by general perspiration. As this stage comes on the temperature begins to fall, and with the falling temperature the patient feels greatly relieved. Most of the symptons such as headache, vomiting and intense thirst abate, and the patient is now probably able to take a little food, and medicine which before caused vomiting, can now be retained.

As the perspiration takes place rapidly, the temperature quickly falls, very often in the course of two hours it has reached the normal point, and the paroxysm is at an end.

The pulse and respiration fall in this stage, and the urine deposits urates and is often very scanty, and high coloured.

Period of Intermission.—The patient now feels almost well. If the attack has not been very severe, he is able to resume his ordinary work; or he may be weak and prostrate, but otherwise quite well.

Very commonly there is gentle sweating for one or two hours after the temperature has fallen.

In very favourable cases there may be no return of the fever, but it usually does return and the same set of symptoms are reproduced.

In unfavourable cases the symptoms return with greater severity and perhaps the fever comes on earlier, thus becoming more like the remittent variety.

During the sweating and intermission stages, the patient is often able to sleep comfortably.

As a chill is very liable to be taken during the period of freedom from fever, great care ought to be exercised, otherwise the patient may have an aggravated attack very likely complicated by hæmoglobinuria, and in some cases I believe that congestion of the kidneys with hæmaturia has been set up; other diseases such as bronchitis are of course liable to be brought on if the patient becomes chilled.

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REMITTENT FEVER.

Remittent Fever in its course and symptoms closely resembles intermittent fever though it is usually more severe. This is the form of fever which I have most frequently met with in Africa. The duration of it varies from three days to two weeks, or even more. In this disease we have a fever in which the end of the paroxysm is shewn by a remission only, there being no period of apyrexia as in intermittent fever.

The course of the paroxysm closely resembles that of intermittent fever, but the premonitory symptoms are often more prolonged and some of the stages may be actually absent or intensified.

The Cold Stage.—This stage is occasionally severe, the patient becoming markedly cyanosed, but it is nearly always short, the sufferer only experiencing a sensation of chilliness and passing rapidly into the second stage. At times there is no cold stage at all.

Usually within the course of an hour this stage has been replaced by the following one.

Hot Stage.—This is usually prolonged and often very difficult to treat; sometimes it lasts from six to twelve hours, or even more—bathing with cold water and antipyretic drugs failing for a time to effect any reduction in the temperature.

There is always considerable headache; the tongue is usually moist and furred, but when the fever is high may become quite dry. During this stage there is frequently considerable vomiting and retching, the vomit being of a bilious character; sometimes the patient cannot even retain iced drinks. When the vomiting is very severe, bright blood is also liable to be brought up; the excessive vomiting is said to be due to gastric irritation and congestion.

Jaundice is frequently present, slight jaundice not being at all uncommon even in comparatively mild cases; but severe jaundice is a very unfavourable symptom. When remittent fever is complicitedly jaundice without hæmoglobinuria, the disease is termed bilious remittent fever. It is probable that all cases of blackwater fever were formerly spoken of as bilious remittent, the "black water" being supposed to be due to the presence of bile.

The pains over the liver, spleen and kidneys are often considerable, these to some extent indicate the severity of the disease. If the pain is great, if the pulse and respiration are hurried, and if the patient is getting rapidly jaundiced, the temperature at the same time remaining high, then great attention should be paid to the sufferer, and the urine should be examined as often as possible so as to detect the first sign of hæmoglobinuria, which is especially to be feared in people who are debilitated from previous attacks of fever, or those in whom early treatment has been neglected.

In very bad cases the tongue becomes quite parched, sordes form on the teeth, and the patient may sink into a typhoid state with marked delirium, which is usually followed by drowsiness or even coma.

SWEATING STAGE.—After the hot stage, the perspiration begins to form as in intermittent fever. In unfavourable cases the fall of temperature is very small and the sweating very slight; but occassionally it is very excessive and sometimes it continues right through the remission. In this as in the hot stage, blackwater symptoms may arise. When the sweating is not free, the remission is likely to be slight and the temperature will soon begin to rise again. Free perspiration is a favourable sign.

Period of Remission.—This follows on the sweating stage. The remission in severe cases is slight and of short duration; in favourable cases it is long, say from six hours upwards.

The remissions are usually quotidian and they nearly always take place in the morning.

Careful taking of the temperature will often shew that what is supposed to be a remittent fever is really an intermittent in which the intermission is very short.*

In this disease, fever seldom lasts longer than five or six days; but it may persist, in spite of treatment, for seven, ten, or even fourteen days, the patient usually feeling better in the morning and worse at night.

Double quotidian fever is unfavourable, and severe remittents tend to become continued fevers.

The tendency of this fever is to get worse, at any rate for a day or two, "the paroxysms usually increase in intensity day by day for a few days,"† and in certain cases the symptoms are extremely severe, the patient is restless and delirious, and the pain in the head is very great; he may be so cold at first that clothes have to be heaped on him, and hot water bottles applied. Some pain over the liver and spleen is usually felt, and this in certain cases is so great that respiration becomes painful; frequently also there is considerable aching over the kidneys.

The head and abdominal symptoms are more marked in the second than in the first stage.

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* Malarial fever as met with on the Gold Coast.—Page 2. Eyles.

† The Theory and Practice of Medicine.—Fourth edition, Page 279 —Bristowe.

I have known a patient to be so delirious and violent that we have had to place a couple of men on guard in his room, but *severe* African fevers, as a rule, cause prostration and collapse.

The thirst in the second stage is usually very great.

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Bristowe states that cases have been reported in which the effect of the malarial poison has been to produce a violent and prolonged cold stage only, in which the patient looks like a corpse, the temperature being actually lowered.*

Again, the same author speaks of cases in which, independently of any other peculiarity, the patient falls into a condition of exhaustion, and lies torpid, motionless as if in sleep, for many hours.

I have seen a few of these latter cases, generally a slight rise of temperature is noticed; the patient wakes up stupid and heavy, but otherwise well. I have known a man to lie in this state for 10 or 12 hours, but, as a rule, the heavy torpid condition only lasts for five or six hours.

New comers, after a few attacks of fever, often have an intolerable longing to sleep, especially during the middle of the day; it is very necessary that this should not be given way to, especially if the sleep is not refreshing in character; sleep in the middle of the day should never extend over an hour. This tendency to sleep is often aggravated by heavy eating and by taking alcohol at breakfast (about 11 a.m.)

Cases of extreme collapse after sweating, have occurred, the patient being apparently on the point of death, but in a few hours, with suitable treatment, the temperature which has been subnormal has again risen to normal.

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* See the Theory and Practice of Medicine.—Fourth edition, Page 279—Bristowe.

Epistaxis has been occasionally seen in both slight and severe cases.

In acute malarial poisoning, spontaneous rupture of the spleen has been known to take place during a paroxysm. I have never seen such a case, and should think that rupture very rarely occurs; but the fact that it may take place ought to make one very anxious to cut short each paroxysm. The symptoms would be acute pain, blanching of the skin, collapse and other signs of internal hæmorrhage.

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BLACKWATER FEVER.

This name is applied to a severe form of malarial fever which is at times met with in West Africa, the fever being usually of the remittent type.

Predisposing Causes.—There seem to be certain special predisposing causes, among which may be noted:—

1.—Exposure to the direct rays of the sun.
2.—Neglected fevers.*
3.—Failing to take quinine.
4.—Excessive fatigue and exhausting diseases.
5.—Exposure to the emanations from newly turned up soil.
6.—Debility brought on by several attacks of fever.
7.—Taking a chill, while suffering from an ordinary malarial fever.

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* Sir Joseph Fayrer's warning is of the gravest importance; in his book—*The Climate and Fevers of India, page* 95, he says "If not now checked, succeeding paroxysms may become more severe with scarcely any remission, and a state of great prostration with delirium, unconsciousness, a brown dry tongue, sordes and hiccough supervene—yellowness of the skin and vomiting of bile and altered blood (black vomit) sometimes preceding death."

In this disease, besides the symptoms of malarial fever—which are usually aggravated—there is yellow tinging of the skin. The urine is either of a bright port wine colour, or else it is so dark that it looks like stout; in bulk it often looks nearly black, the froth is of a reddish colour, the colour is due to the presence of hæmoglobin, and the urine contains a large amount of albumen.

In nearly all severe cases of blackwater fever there is persistent vomiting of green bile, I believe that there is green bilious vomiting in all fatal cases; but in some favourable cases there is little or no vomiting, and as there is at times green vomiting in cases in which there is no hæmoglobinuria this symptom cannot be taken as being absolutely diagnostic. Bile may be present in the urine in this disease though it is probably generally absent.

In many of these cases there is considerable pain over the kidneys, due I believe to congestion, and it is possible that actual nephritis may be developed on account of the irritating effects of the passage of hæmoglobin. Frequently also there is pain and enlargement of both the liver and spleen.

In true blackwater fever there is hæmoglobinuria,* not hæmaturia, but in special cases it is quite conceivable that hæmaturia may follow closely on it, due to nephritis, and this I believe is the explanation of those cases in which large amounts of blood cells have been found to exist. The hæmoglobinuria usually comes on during the latter part of the second or earlier part of the third stage. It is preceded in every case by jaundice, and it usually does not come on till the fever has been established at least for a day or two.

One attack of hæmoglobinuria seems to predispose to another, therefore after an attack, a return to a non-malarious climate is advisable. Patients who have had blackwater fever ought always to wear a flannel belt, and must be especially careful of chills for they may bring on another attack, or cause kidney mischief.

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*An Epitome of Current Medical Literature, Article 219, p. 41, September 10, 1892. See notes on four cases of malarial hæmoglobinuria.

Too great stress cannot be laid on what I believe to be a fact, viz.: that blackwater fever is not a separate disease but that it is a malarial fever, which is so severe that the red blood-cells break down in such very large quantities that the hæmoglobin cannot all be absorbed, and therefore a large part of it has to be excreted by the kidneys, this blood pigment also causing the jaundice, which is probably not due to disturbance of the liver.

The cause of the disintegration of the red blood-cells is not known for certain, it is probably directly due to the plasmodium malariæ; at the same time it is to be noted that the presence of bile in the blood is able to cause hæmoglobinæmia and hæmoglobinuria.* It is possible that blackwater fever may be proved to be merely an intensification malarial bilious fever.

One of the greatest dangers in blackwater fever is collapse, due to the disintegration of a large number of red blood cells, another is inflammation of the kidneys which may bring on suppression and uræmia.

As far as I know, the onset of blackwater fever is hardly if ever sudden; in nearly all my cases I have found it difficult or impossible to fix the exact time of the onset, of the feverish symptoms.

It is contended by some people that the "blackwater" which gives the disease its name is due not to hæmoglobinuria but to hæmaturia.

Of course this can only be settled in each case by a careful examination of the urine almost directly it has been passed. In tropical climates the urine very rapidly undergoes decomposition, and the red cells in a case of hæmaturia would soon be broken down, microscopical examination would then be unable to prove the hæmaturia.

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* See page 49 *Clinical Diagnosis.* Prof. v. Jaksch.

There is no doubt that a severe attack of any form of malarial fever may be complicated by hæmaturia, for people who have had previous attacks of true blackwater fever are very liable to have hæmaturia whenever they have a severe malarial paroxysm. A medical man who had had two undoubted attacks of blackwater fever in Africa, wrote to me that he had had two attacks of hæmaturia without any other important signs of malaria. The presence of "blackwater" alone would not justify us—even in the presence of malarial fever—in calling any given case blackwater fever.

I was once called to see a man who felt certain that he was suffering from blackwater fever. I found this patient sitting up, and beside him was a chamber half full of blood and urine. He felt rather faint, had slight fever, there was no jaundice and though he felt sick he did not vomit. Now in this case there was considerable hæmaturia, but the patient was not suffering from blackwater fever; he had for a long time suffered from stricture, chronic cystitis and kidney trouble, and frequently had attacks of hæmaturia, often complicating slight fever, this patient had lived on the West Coast of Africa for many years.

I may mention, that as far as I know, blackwater fever hardly ever attacks old coasters if they have not suffered from it within two or three years of their first visit to West Africa. It is also noticeable that blackwater fever seldom, if ever, comes on within the first year of residence on the coast, and it only attacks those who are anæmic and broken down by malarial poisoning; but it is quite conceivable that a young healthy new comer may have hæmaturia with his first attack.

More extended experience may lead to some modification of the above views, I am only giving my own experience.

In a very interesting article, Dr. Castle speaking of the non-parasitic form of hæmaturia in East Africa, the following passage occurs :—

"The first quantity of urine which is passed after this will be absolutely black, and is found to contain a large quantity of grumous material, composed of disintegrated blood-cells. At this stage of the disease no actual blood-cells can be discovered by the microscope; but as the patient recovers, and the amount of blood passed is less in quantity, it becomes more like real blood in its appearance, and cells more or less altered can be readily made out."*

There seems to be a great resemblance between the action of certain drugs and blackwater fever.

In the supplement to the *British Medical Journal*, December 13th, 1890, is given an account of poisoning by Chlorate of Potassium, which brings out this resemblance very markedly.

The patient was anæmic, cyanotic, had rigors and slight jaundice, the urine which contained albumen, was small in amount—about one drachm—red in colour, and deposited a brown sediment of altered blood corpuscles, crenated, broken down, and in irregular clumps. Death occurred on the eighth day without convulsions or special uræmic symptoms; the liver, kidneys and spleen were enlarged. Landerer came to the conclusion that the anæmia and most of the symptoms were primarily dependent on excessive blood destruction, the disintegrated corpuscles blocked up the urinary tubules, and this led to nephritis; he advises blood-letting and transfusion.

I have said that one attack of blackwater fever predisposes to another; there can be no doubt that this is so. I know one patient who has had at least ten, and another who had eight attacks of the disease. It is a curious fact that some patients seem to become accustomed to this form of malarial poisoning, and that the later attacks are often less severe than the earlier ones, this being especially noted in the vomiting which becomes less green in colour and less in amount, and may even be absent.

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* *The Lancet*, *April*, 1891.

In looking over the notes which I have of cases of Blackwater fever, I find that nearly every patient has attributed his "blackwater" to some definite cause; this usually being either getting wet and chilled, or else having been exposed to the sun when suffering from fever.

The great trouble in these cases is that the medical officer seldom sees the patient till the blackwater symptoms are established and the patient has been unwell for some days, thus very valuable time has been lost, and the patient's chances of complete recovery considerably reduced, and of course it is often impossible to say if the onset of the disease has been sudden.

It is well known that a European in Africa may be very ill and yet hardly know it; if while in this state he becomes jaundiced and the urine turns red, one is likely to be told that the disease came on quite suddenly. At one of our stations I once noticed a young European taking a list of the cargo which was being put on board a ship. I thought he looked rather unwell so I asked him how he felt; he said that he was "all right," but that for a day or two he had been feeling rather tired. His temperature was 103, and, within 24 hours, he was suffering from blackwater fever. It is interesting to note that almost directly he was cured he had another attack of the same disease; this is the only case I have met with in which there has been a second attack following almost at once upon a previous one.

Dr. Easmon, has published in the *Medical Times*, August 29th, 1885, a most interesting account of a case of blackwater fever. The patient had been ailing for some time, and on the second day of the fever, the blackwater symptoms came on. In discussing the pathology of the disease he speaks of "its being invariably preceded by attacks of intermittent fever." This is a matter of great importance—some of my own cases shewed this in a marked manner—but whether these intermittent attacks *always* precede an attack of blackwater fever I am unable to say. He also mentions that "in the worst forms of blackwater fever the vomit assumes a bluish black colour, but this is as distinct as possible from the "coffee grounds" vomit of true yellow fever." I have never seen anything like black vomit in malarial fevers.

Hæmaturia.—In most cases of hæmaturia occurring in West Africa, without any obvious cause, malaria will be found to be at the bottom of the trouble.

If it is thought that quinine is causing the hæmaturia, then it will be advisable to use some other drug such as arsenic.

In non-malarious hæmaturia, the history of the case and the temperature chart will be of great assistance in arriving at a correct diagnosis, and there will not be the marked jaundice and vomiting, so frequently met with in cases of blackwater fever, unless of course it has come on during an attack of this complaint.

In speaking about the diagnosis of yellow fever, Sternberg writes.

"There is a form of malarial fever, however, the so-called "hemorrhagic malarial fever," which is characterized by the periodical appearance of blood pigment in the urine, with sometimes a tendency to hemorrhage from mucous surfaces. This is the *fievre bilieuse melanurique* of the French authors. The clinical history of this disease differs entirely from that of yellow fever.

"The distinguishing characters are given by Berenger-Feraud as follows:—

"Prolonged residence in a malarial country is the most powerful, and, indeed, indispensable predisposing cause. The disease is always preceded by numerous attacks of malarial fever, simple at first, then more and more complicated, and taking in general more and more of a bilious aspect, producing a very decided anæmia. Icterus appears at the outset of the attack, and is never wanting; it gives from the commencement and throughout the attack a uniform yellow color to the patient, varying from greenish-yellow to a decided yellow ocher. The march is intermittent or remittent from the first, and the pulse, urine, and vomiting follow very exactly the variations of temperature."

* * * * * * *

"The vomiting is bilious, of a decided green colour; it is a constant symptom at the outset of an attack, and is arrested with the termination of one attack to reappear with the next. After the first, or febrile, period the vomiting continues, but preserves the same characters; it stains the linen a bright green, and when collected in a basin, it appears transparent, and is of a beautiful emerald-green or olive color.

"The tongue is moist, broad, covered at first with a heavy white fur, which soon receives a greenish tint from the vomited matters. The tongue is not red, either upon its tip or edges; it remains broad, heavily coated, and moist to the end of the malady.

"The urine is black from the commencement, and its color is characteristic, so that the patient himself is struck with it. It is usually abundant and frequently passed, and only has the melanuric aspect during the attack."*

The above description very much resembles the description which I have given of blackwater fever, but I have

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**Report on the Etiology and Prevention of Yellow Fever* by George M. Sternberg, Lieut. Col. and Surgeon, U.S. Army.

certainly seen the tongue dry and brown, and the urine in my experience has not after once having cleared become dark again. In a note which I have just received from West Africa, Dr. Smith mentions that he has had under treatment a case in which the urine was passed 3 times daily, and that it only contained blood pigment at the second time of passing it on each day.

In my experience there has always been jaundice, *before* the urine has become dark, and there is a tendency to suppression in nearly every severe case, and green vomiting is not *always* present.

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TREATMENT OF MALARIAL FEVER.

The object of the treatment in all varieties of malarial fever is either to cut short the attack, or to modify the fever and other symptoms of the disease, so that serious complications may not arise.

There can be no reasonable doubt that the administration of quinine, when the first symptoms of fever are noticed, does at times prevent any further development of the disease.

In all cases of malarial fever the bowels must be kept well open. At the beginning of the disease a sharp purgative should be given, and if it does not act quickly, it must be repeated without loss of time. An enema can only do good and may produce immediate free evacuation of the lower bowel, but it is always advisable to clear out the whole gastro-intestinal tract. I usually give at the outset three pills of calomel and colocynth, made into a powder, so that they may act quickly. These are followed up in two or three hours by a saline purgative draught. Care must be taken that the patient is not purged too much.

The old plan of giving *constant* and *large* doses of calomel or other aperients has, I believe, in many instances, brought on so much prostration that the patient's condition has been made worse instead of better. Having once freely opened the bowels it can only do harm to keep them more than gently relaxed.

Fayrer says (p. 112): "In former days calomel was regarded as an essential part of the treatment, and large and frequent doses were given; an occasional dose of a few grains combined with colocynth may be useful, especially when there are hepatic complications, but beyond this it is not required."

As soon as it is seen that the attack is coming on no time should be lost. An aperient must be given and the free administration of quinine must not be delayed.

Put the patient to bed, cover him with a sufficiency of clothes, and give 10 to 25 grains of quinine. The quinine may be given with the purgative; frequently it is advisable to give it at once by the rectum.

The room ought to be well aired but not draughty.

THE COLD STAGE.—Warm drinks, such as weak tea and milk, barley water, or thin beef tea, ought to be given freely.

In some cases where the cold stage is very acute, the patient being shrivelled and cyanosed, a glass of hot whisky and water will do good; hot water bottles should be applied to the feet and back.

Special symptoms, such as pain over the spleen or other abdominal organ (due to engorgement), collapse, vomiting, scalding of the urine, &c., must be treated as they arise, but the giving of quinine and a purgative (if necessary) must not be neglected.

A hot foot bath containing plenty of mustard, is a favourite coast remedy, and often does good.

The Hot Stage.—During the hot stage antipyrin (phenazonum) will often be necessary as it soothes the patient, diminishes headache, and promotes perspiration, and so helps to cut short the attack.

The patient will experience great relief if effervescing cooling drinks are given to him, and if possible he should be allowed to suck ice, and all liquids should be cooled. Evaporating lotions, or the application of an ice bag, or Leiter's coil to the head, will be found very beneficial, they relieve headache and tend to prevent delirium. Where ice is not procurable, cold sponging of the face, arms and chest will be of service.

If the hot stage is prolonged, and there is little or no sign of perspiration, the body may be sponged with warm water, or a warm bath may be given, the patient at the same time drinking hot liquids.

Jaborandi may be given; in one case while it caused free perspiration it was noticed that the temperature continued to rise in spite of the free sweating produced by this drug. If there is pain over the liver or spleen a linseed and mustard plaster should be applied. Some patients feel great relief if during the earlier stages of the fever they are made to vomit.

When the vomiting is severe as it frequently is,* drugs often fail to be of any service; bismuth, opium and dilute prussic acid at times do good, and in some cases one-drop doses of tincture of iodine have seemed to be of service. Time will probably be saved if the bowels are well opened, if the patient is made to thoroughly empty the stomach, and a hypodermic injection of morphine be given, he at the same time being allowed to take only ice by the mouth. A mustard plaster over the pit of the stomach will often stop excessive vomiting.

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* Dr. Grant, in his book on West African Hygiene, speaks of the value of bicarbonate of sodium where nausea or vomiting are prominent symptoms, page 16.

Where the urine is acid and irritating it will be necessary to administer alkalies, the best being probably bicarbonate of sodium. Dr. Sternberg has greatly reduced the mortality from yellow fever by suggesting what is called the alkaline treatment. He devised this plan of treatment because he noticed the extremely acid condition of the urine in yellow fever; he says (p. 90) "One of the principal objects I had in view in prescribing full doses of bicarbonate of sodium at regular intervals was to neutralize the very acid condition of the urine, in the hope that it might be secreted more abundantly and with less injury to the renal parenchyma."

Dr. Sternberg suggests the following formula:—

"R. Sodii bicarb., grammes xvi (ʒiv).
Hyd. chlor. corros., centigrammes iii (gr $\frac{1}{2}$).
Aquæ Puræ, litre 1 (1 quart) M.

Sig.: 50 grammes (about $1\frac{3}{4}$ ounces) every hour; to be given ice cold."

Some allowance of course is made for the age of the patient, severity of the case, &c.

Now inasmuch as the above treatment has been found very useful in yellow fever, which, though a disease entirely distinct from malarial fever, has *at times* many of its symptoms, such as the tendency to suppression, excessive vomiting,* and frequently a very acid condition of the urine, I think that this treatment, or some modification of it, ought to be tried in certain cases of malarial fever in which these symptoms are present.

The small amount of corrosive sublimate in the formula might be beneficial, inasmuch as a preparation of mercury is by some considered necessary in cases of malarial fever.

Bicarbonate of sodium will certainly do good. In a great number of cases an alkali has to be given to render the urine less acid, and bicarbonate of sodium is a much better preparation to give than the same salt of potassium; for as Sternberg points out, (p. 94) the potassium salts are directly contraindicated in a disease in which there is a great tendency to suppression of urine, and uræmic poisoning; and there are certainly some cases of malarial poisoning in which there is this tendency.

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* Small and frequent doses of Chlorate of Potash with *Bicarbonate of Sodium*, are very useful in the vomiting of yellow fever.—See *Medical Annual*, 1892, p. 519.

The administration of some such preparation as the above, need not in any way interfere with the giving of quinine. I may mention that I have always considered that an alkaline or neutral reaction in the urine of blackwater fever is a very favourable sign.

It is to be remembered that the blood is normally alkaline in reaction, and that this alkalinity is largely due to *bicarbonate of sodium*; the alkalinity of the blood is often diminished in fever, it is also reduced when there is uræmia, persistent vomiting, or pernicious anæmia.*

If the temperature remains high, say 104 to 105, for some hours, or if it keeps rising, then either a wet pack or a cold bath will have to be given.

THE WET PACK.—A blanket is laid on a table, the patient is wrapped in a sheet which has been wrung out in cold water, and is laid on the blanket; he is then covered with two or three blankets for twenty minutes or half-an-hour; the pulse and temperature must be our guides as to the advisability of repeating the pack. In only two or three cases have I judged it necessary to use the wet pack, and in these it did great good, and I should think that it could never do harm; as a rule the patient should not be left longer than twenty minutes, or half-an-hour in the wet pack.

THE COLD BATH.—I have never had to use this, as in nearly all my serious cases there has been a tendency to collapse and a low temperature; this collapse has been specially noted in all grave cases of blackwater fever, and is probably due to great destruction of the red blood cells.

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* See *Clinical Diagnosis*. Prof. v. Jaksch.

The temperature of the bath should be about 9 to 10 degrees below that of the patient. Cold water should be poured in till the temperature of the bath is 68.

No one bath should extend over a quarter of an hour.*

The patient, on being taken out of the bath, should be lightly rubbed and laid between warm blankets.

He must, while in the bath, be watched very carefully so that any symptoms of faintness or collapse may be detected as soon as they arise.

Sweating Stage.—During the sweating stage very little need be done in the way of treatment; as a rule it is not necessary to administer quinine, but it can do no harm to give it, and it may do good, as at times the perspiration is small in amount and short in duration, and is followed almost at once by a rise in temperature, there being no marked remission or intermission in which to give the quinine. Only enough clothes should be kept on the bed to prevent the patient becoming chilled; excessive and prolonged perspiration should not be encouraged, as it is very debilitating. Nourishing liquids should be given to make up for the loss of water by sweating.

It is always advisable to have a second bed ready so that, when the temperature is going down and the sweating is becoming less profuse, the patient may be moved into a comfortable, cool, dry bed.

During the remission or intermission it will be advisable to give quinine, at the same time nourishing food should be administered in order to render the patient more able to withstand the coming attack.

Blackwater Fever.—The treatment of blackwater fever is practically that of a severe form of malarial fever.

Free purgation is very necessary in the earlier stage of the disease; in nearly all cases persistent vomiting will

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*[*A Text Book of General Therapeutics*, page 165.—Hale White.

be present and must be treated actively. The patient's strength should be supported from the first and quinine must be given, the pulse, temperature and general condition of the patient being the guides as to the amount necessary ; stimulants will often be required.

To diminish the danger of kidney trouble a large mustard, or linseed and mustard, plaster must be applied over the loins. Dr. Whittindale found that a liver pad containing diluted nitro-hydrochloric acid was of great service in one case in which there was considerable hepatic pain.*

When vomiting is persistent a mustard plaster should be applied over the epigastium, and the patient should be made to thoroughly empty the stomach ; immediately after this has been done it is often found that the sufferer can retain certain drugs and even a small amount of nourishment. The lower bowel should be well cleared out with a warm water enema and necessary food and drugs should be given per rectum with a long tube ; the patient should be allowed to suck ice† continually and if necessary nothing else should be given by the mouth. Often a hypodermic injection of morphine will do good. At times small doses of brandy or champagne help to check the vomiting, bicarbonate of sodium should also be tried.

If the patient becomes very exhausted and the temperature is normal or subnormal it may be advisable to administer quinine less freely; and every effort should be made to prevent fatal collapse by the judicious use of stimulants, nutrient enemata, and the application of hot water bottles.

Phenazonum, or as it is commonly called antipyrin, will nearly always be found useful in this complaint, the tendency seems to be to give both quinine and antipyrin rather than to give enormous doses of quinine by itself.

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* See case 17.

† Hitherto one of the greatest troubles in Africa has been the impossibly of getting ice for our sick people, but that difficulty has now been overcome by the introduction of a freezing machine, by the Piston Freezing Machine Company, Oxford Street, which is simple, inexpensive, and never gets out of order.

If in spite of all treatment the patient becomes more and more collapsed, then the intravenous injection of a saline fluid, a drachm of common salt to the pint of water, may be resorted to. A Lane's syringe should be used.*

In one desperate case I did this, the patient revived for a few hours, but eventually he got worse and sank. In a future case I should be inclined to repeat the injection, injecting a large amount say 60 to 80 fl. ozs. at a time.

If a medical man is not at hand, enemata of salt and water of the above strength may be given.

When the patient is in a state of great prostration hypodermic injections of ether and brandy will be necessary.

In all cases of blackwater fever, the urine will be found to contain a large amount of albumen, and there is frequently a tendency to suppression, this being almost constant in very serious cases. When this is so, diaphoretics, rather than diuretics should be given. If convulsions or coma are present, they are probably due to uræmia, and chloral hydrate should then be given in addition to jaborandi or other diaphoretic medicines.

In these cases, probably the alkaline treatment suggested by Sternberg would be of great value.

It is important that the patient should be impressed with the fact that in the majority of cases, blackwater fever is not dangerous if it is promptly and properly treated; for many people when they see their water "black," lose all hope, even though they do not feel extremely ill; and as they think they have some new and unnatural complaint, it should be pointed out to them that a breaking down of the red blood corpuscles takes place (to a smaller degree) in health.†

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* See description of this instrument by W. Arbuthnot Lane, M.S. —*Lancet*, September 12th, 1891.

†"We have evidence that a continual destruction of red corpuscles is going on in the body."—*Human Physiology*—page 67, Starling.

It is a pity that we cannot get rid of the unfortunate name blackwater fever, but it has come into general use and will I suppose continue to be used in spite of its inaccuracy. Some good may be done by assuring the patient that there are many people now alive and well who have suffered from this complaint, which is wrongly supposed by some to be always fatal. Eyles after recording a case of this disease writes as follows : "on the voyage the patient rapidly convalesced, and six months after, on meeting him in London, he appeared none the worse for his acquaintance with African fever."*

Blackwater fever as far as I know, never comes on till the patient has had several attacks of ordinary malarial fever and seldom if ever within the first year of residence in Africa. I have heard of its coming on almost directly after arrival in West Africa, but I have no knowledge of such cases; if they do occur, I believe that there must have been some special cause, *e.g.* previous residence in other malarious countries or some special complaint such as anæmia. Blackwater fever is perhaps closely allied to paroxysmal hæmoglobinuria, and it has even been said that in some cases of the latter disease there has been well marked jaundice.

MALARIAL HÆMATURIA.—Very little need be said about the treatment of malarial hæmaturia, as the cause rather than the effect must be treated; as a rule, the hæmaturia should not be actively interfered with, as it is probably beneficial. Purgatives may be administered and ice should be sucked, the skin at the same time being made to act freely; the application of mustard plasters or ice bags over the kidneys, or dry cupping will probably be of service. If the bleeding is excessive, ergotin should be given hypodermically.

AFTER TREATMENT.—When the attack of fever has passed off, the patient should take at least six grains of quinine daily for a week, the diet should be light and nourishing, and, as a rule, spirits and beer are to be avoided, a glass of champagne or claret at meal times will probably do good. For a time, at any rate, the patient ought to take great care not to get chilled, and it is especially important that if he goes out of doors he should wear a helmet. Disregard of these obvious rules has frequently brought on a second attack of fever, and I have generally found that an attack which follows closely on the previous fever is of a severe kind; the fever may not be so high, but the patient is less able to bear it. After a fever, a tonic is always required, the favourite one on the Niger and one which I have found very useful, contains arsenic, dialysed iron, diluted nitro-hydrochloric acid, and chloroform water; this should be taken for at least a week after an attack of fever, but the taking of quinine must not on that account be neglected.

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* Malarial fever as met with on the Gold Coast: Page 59—Eyles.

After a fever a short sea or river trip or even a change to another station is advisable; I have long noticed that people who travel a good deal by water are more free from fevers than those who do not.

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QUININE.—This is the most valuable drug we have for the treatment of malarial fevers, it is a specific which rarely fails; when it does, there will probably be some special reason such as extreme malarial cachexia, organic disease of the liver or kidneys, and in rare cases of hæmoglobinuria such extensive destruction of the red blood-cells that no drug can be of much service, the patient's condition being somewhat like that brought on by excessive hæmorrhage.

The sulphate of quinine is the preparation most generally used, the objection to its use is, that it is very insoluble in water, and has therefore, if it is wished to administer it in solution, to be dissolved by an acid.

The acid hydrochlorate, the hydrobromate and the disulphate (acid sulphate of quinine) are very soluble in water and are probably the most valuable preparations of quinine we have, either for administration by the mouth or rectum. When acid solutions are used hypodermically they are very irritating, and may cause inflammation and suppuration.

I usually give the acid sulphate of quinine (this disulphate of quinine is sometimes called the *neutral* sulphate of quinine) in the form of tabloids (Burroughs, Welcome & Co.) This preparation of quinine dissolves very quickly, and patients can usually take it even when they are unable to take any other.

I have also used quinine pills and capsules, but they take some time to dissolve.

By old coasters, quinine is frequently taken either in a wine-glass of beer, limejuice, or champagne, or wrapped up in a cigarette paper.

In certain cases the best way to give quinine is by a hypodermic injection,* perhaps the best preparation is the hydrobromate, which has a slightly alkaline reaction. The lactate of quinine is neutral in reaction and much more soluble than the hydrobromate; the solubility of the former is 1 in 10, that of the latter 1 in 24. Great care must be taken that the syringe is absolutely clean; several cases of tetanus have been reported to have followed the hypodermic injection of quinine, but these cases must have been due rather to the condition of the instrument used than to the drug, if tetanus depends (as no doubt it does) on a definite bacillus; the same remark probably applies to many cases in which abscesses have formed after the hypodermic injection of quinine; at the same time it is to be remembered that the patient's condition is most unsatisfactory, and it is notorious that Europeans living in

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* "For injection it is recommended to dissolve the quinine in ether, as this solution is less irritating than an acid, alcoholic, or chloroformic solvent."—*Handbook of Therapeutics*, (Tenth Edition) page 593. —Ringer.

Africa are liable to suffer from abscesses and boils even when they are in apparently good health. Before administering a hypodermic injection of quinino the skin ought to be well washed and then disinfected with a solution of perchloride of mercury.

Speaking of the hypodermic injection of quinine, Fayrer says: "and if the needle is made to enter the subcutaneous tissue *with its aperture turned away from the undersurface of the skin,* there is little danger of local mischief, though abscess, sloughing, and erysipelas, and even tetanus have followed the operation."*

If quinine is given hypodermically, probably it would be advisable to inject it deeply into the fleshy part of the buttock; if a large dose, say 10 grains,† is to be administered, then two or more injections should be made at some distance from each other.

Quinine is usually administered in one or two ways; either a large dose is given before each attack, or smaller and more frequent doses are given both during the attack and during the intermission or remission. In my opinion you must give quinine how and when you can, and each case must be treated on its own merits.

Many patients believe that they ought not to take quinine while the fever is on them. I know a case in which this principle was acted on—it was thought best to wait for an intermission—but it never came.

The best times at which to give quinine are during the premonitory stage and after the paroxysm, but it can be given at any time. If possible the patient should be brought under the influence of it before the hot stage is well established, if given after this, the drug is not likely to have much effect on the paroxysm; it is also very unpleasant for the patient to have to take quinine during this stage, probably he is vomiting a great deal and therefore cannot retain it; but if he has not taken any it must be given, hypodermically or by the rectum if necessary.

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* *The Climate and Fevers of India,* p. 109.

† "Only about one-third or one-fourth of the dose is to be used hypodermically that would be given by the stomach, 2¼ to 3 grains being usually sufficient to overcome a simple intermittent attack."—*Cyclopædia of the Practice of Medicine,* page 663, Hertz.

The quinine must not be left off too soon, and it must be given freely. I have known patients to take 60 or 80 grains or more of quinine daily without any bad effect beyond headache and deafness, and at times vomiting. This last symptom is due to the irritant effect of quinine on the stomach.

Most patients however do well on much smaller amounts than 60 or 80 grains, and it is most probable that when such large amounts are given a great part of the drug is not absorbed. "Poisonous doses (of quinine) excite great thirst, burning pain at the epigastrium, and vomiting."*

It is impossible to lay down any fixed rule as to the amount of quinine which ought to be given in all cases of malarial fever, each case must be treated on its merits, for no two cases are exactly alike; and while some cases get well with very little quinine, others get worse in spite of the administration of enormous doses of this drug. The best guides will be the pulse and temperature. As a rule a remittent will require more quinine than an intermittent.

I believe that 15 to 25 grains of quinine should be given at the very beginning of an attack; as a rule, quinine will not be necessary during the hot and sweating stages, but during the remission or intermission, 10 to 25 grains more quinine should be given. In this way, the patient will take before the second paroxysm begins from 25 to 50 grains. This method of treatment should be followed right on through the disease, the amount of quinine being regulated by the temperature, &c.

Speaking of the treatment of remittent fever Fayrer says (p. 109): "A full dose of quinine, 10 to 15 grains in solution, should be administered; 20 or even 30 grains are sometimes given. I doubt if they do more good than 10 grains; but am quite prepared to admit that 15 to 20 grains may occasionally be necessary."

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* *Handbook of Therapeutics*, Tenth Edition, page 589. Ringer.

In most cases, 20 to 30 grains daily will be quite sufficient, but in some cases it is necessary to give very large doses of the drug; it is certainly safer to give an extra dose than not to give enough, for, as has been pointed out, an apparently mild case may become a very severe one.

It must be remembered that quinine will act much better if the bowels have been well cleared out and the stomach is free from bile.

Quinine is said to cause hæmaturia; I think that it rarely if ever does so, but many observers believe that it can. (See article by H. A. Hare, *Ther. Gaz.*, July, 1892.)

The hydrobromate of quinine does not cause so much headache as the other preparations of this drug.

Speaking of the administration of quinine, Fayrer says:*

"When the fever tends to assume the adynamic form or become continued; when typhoid symptoms appear to be setting in; when there are delirium, sordes of tongue and lips, muttering, tremor of muscles, dry hot skin, abdominal, hepatic, and splenic tenderness with delirium, depressed cardiac action, and feeble pulse; or, on the other hand, when the febrile condition assumes the sthenic type, and no signs of remission appear, or only in the most transient form, quinine should be given irrespective of the remission."

PHENAZONUM OR ANTIPYRIN.—As has been mentioned, this drug is often of great service especially during the hot stage; it has however, to be administered with some caution, especially in people who suffer from cardiac trouble, as it is a depressant. If the patient is very hot I usually give 15 to 25 grains of it, and it is very seldom necessary to repeat the dose during the paroxysm.

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* "*The Climate and Fevers of India*," p. 110.

Large quantities of a antipyrin produce hæmoglobinuria,* but this effect is never caused by medicinal doses. I have even heard it said, that since this drug has come into general use, cases of blackwater fever have become more common, this may true; but I believe that the antipyrin has had nothing to do with the blackwater symptoms. In nearly all the very bad cases of blackwater fever I have seen, the patients have had hæmoglobinuria before they were seen by a medical man, and in no case, as far as I could find out, had they taken antipyrin.

I have already stated that antipyrin seems to be of great service in cases of blackwater fever, but where there is much prostration with a normal or subnormal temperature, the drug is not called for, and will probably only do harm.

Arsenic. — This drug undoubtedly has antiperiodic properties. In one or two cases of fever occurring in old coasters, I have thought that it acted quite as well or better than quinine, but as a rule, I never use it during an attack of fever. In most cases of chronic malarial poisoning it will be found to be very useful, especially if combined with iron.

Iron.—It has been suggested that iron should be given in all cases of hæmoglobinuria. I believe that it would be well to try it when the temperature is not very high; I have given it myself under these circumstances, the patient being, I believe, benefited by its use.

Warburg's Tincture.—I have entirely given up the use of this, the taste is most unpleasant, and I believe that not being allowed to drink between the doses is very distressing and harmful to the patient.

Pilocarpine is occasionally required where the hot stage is very pronounced and where there is little or nc sweating, or when there is a tendency to suppression.

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* Materia Medica, Pharmarcy, Pharmacology and Therapeutics, page 280.—Hale White.

Opium.—I believe that opium is one of the most valuable drugs we have, of course it must be cautiously given—but in moderation, say one to two grain doses, it can do little or no harm, and I have certainly seen an attack of fever cut short by it. When the patient is suffering from insomnia, great restlessness or vomiting, its exhibition is often followed by the happiest results.

Ipecacuanha.—In some cases this drug either alone or in combination with opium is clearly indicated. It is especially useful where there is much gastro-intestinal irritation.

Nutritive Enemata.—In certain cases it is absolutely necessary to administer nourishment by the rectum, it is of course of the greatest importance that the injection should contain food which can be easily absorbed by the lower bowel.

Dr. Wetherhed mentions that enemata are often of little nutritive value, as in the case of bouillon, or difficult of absorption, as in the case of milk.

Dr. Huber, of Zurich, has found that the absorption of raw eggs is easily accomplished, being greatly aided by the addition of common salt. The salt is well borne, and causes, as a rule, no irritation of the bowel. To two or three eggs he adds 30 or 45 grains of salt, the eggs and salt are beaten up and are then slowly injected by means of a soft-rubber tube carried as high up the bowel as possible. Three such enemata are given daily; an hour before each enema, the rectum is cleared out by means of a large injection of warm water.*

"A nutrient enema should not exceed three or four ounces of bland, unirritating material, otherwise the lining membrane of the rectum becomes irritated and inflamed, a condition adverse to absorption. Mr. Marcus Beck advises the addition to the injection of pepsine and dilute hydrochloric acid. From experiments on dogs M. Bauer finds that the large intestines freely absorb peptones, but that pure soluble albumen is not absorbed, though it is taken up readily on the addition of salt. Acid solutions of albumen, as meat dissolved in weak hydrochloric acid, are also freely absorbed."*

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* See *Medical Annual*, 1892, page 342.

Dr. Hale White points out that "Leube found that the best enema, that is to say the one which is most nutritious, most readily absorbed, and least irritating, could be prepared as follows: – The meat is first sliced very thin, and the slices chopped as fine as possible; of this from five to ten ounces are taken together with from one to three ounces of finely chopped pancreas, free from fats, and to this mixture about a quarter of a pint of lukewarm water is added. Three or four ounces of this mixture may be injected each time through a syringe with a nozzle sufficiently wide to take it."†

"EGG AND MILK ENEMA.—(1) Take

The yolks of two eggs	
Bicarbonate of sodium	20 grains.
Milk to	4 fluid ounces.
Liquor pancreaticus	2 fluid drachms.
Common salt	30 grains.

Mix together the eggs, milk, and bicarbonate of sodium; heat to 140° F., add the liquor pancreaticus, leave the mixture to stand for three hours at the temperature of the room, or for half-an hour at a temperature a little less than 140° F.; heat for a minute to boiling point, and add the salt before use.

Or thus:—(2) Take

The yolk of one egg	
Beef tea	1 ounce.
Liquor pancreaticus	1 drachm.

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* *Handbook of Therapeutics*, Tenth edition, Page 97, Ringer.

† *A text-book of General Therapeutics*, page 86, Hale White.

Milk to	4 ounces.
Common salt	30 grains.

Beat up the egg and beef tea, add the liquor pancreaticus, and then the milk, making up the whole to four ounces. Heat the mixture to 140° F., and let it stand for ten minutes. Then heat to boiling point for a minute, add the salt, and inject at a temperature of 100° F.

Egg, Milk, and Brandy Enema.—Make as the Egg and Milk Enema up to 3½ ounces, but just before use add half an ounce of brandy. For these enemata either Benger's liquor pancreaticus, or five grains of Fairchild's zymine (extractum pancreatis) may be used."*

EFFECTS AND SEQUELAE OF MALARIAL POISONING.

At first one attack of fever predisposes to another, later on the patient becomes more or less acclimatised—this is specially noticeable in those who have chronically enlarged spleens.

Repeated attacks of malarial fever cause anæmia and more or less impairment of the health, and a condition which is known as malarial cachexia. The cachectic condition is largely due to the breaking down of the red blood cells, either in the spleen or in the circulation, and probably is directly caused by the plasmodium malariæ.

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* *The Pharmacopœia of Guy's Hospital*, p. 196, 1891.

Some of the liberated colouring matter of the blood is deposited in the internal organs, *e.g.*, brain, spleen and liver; some of it is also deposited in the skin, causing a characteristic sallow yellowish tint; some of it may block up the capillaries of different parts giving rise in certain cases to very serious symptoms, such as cema; and perhaps the boils, which are so common in those who have resided for any length of time in Africa, are due to the same cause.

Malarial cachexia is shown by general wasting, a sallow or jaundiced complexion, absence of blood from the lips, occasional bleeding from the gums, dyspnœa on slight exertion and cardiac weakness; the spleen is usually found to be enlarged, and there may be some œdema of the ankles. The patient complains of some loss of memory, nervousness and great debility, together with giddiness and frequent insomnia.

Treatment.—Arsenic and iron are of great value in cases of malarial cachexia, but no permanent good can be done while the patient is exposed to the malarial poison. The best treatment therefore is, for the patient to remove to a non-malarious climate. In all cases of malarial anæmia and cachexia some stimulant such as claret is necessary.

◆

Boils are liable to appear in great numbers on almost any part of the body in people who have resided for a considerable length of time in West Africa—they are usually small and very painful, sometimes they are very large and destructive.

Carbuncles are at times seen in people who have become very debilitated.

Treatment.—Boils ought to be treated by the application of poultices and hot fomentations, it is rarely necessary or advisable to make an incision in order to evacuate the contents.

Where carbuncles appear they clearly indicate considerable deterioration of health, and removal to a healthy climate is absolutely necessary.

Iron, arsenic, and quinine, with a liberal allowance of nourishing food, and some stimulant will always be necessary; in some cases sulphide of calcium seems to prevent the formation of boils.

It is a curious fact, that African boils frequently leave behind them a peculiar pigmentation of the skin, which closely resembles the staining due to syphilis.

◆

CHRONIC ENLARGEMENT OF THE SPLEEN, OR AGUE CAKE. This is caused by prolonged residence in malarious countries and repeated congestions of the spleen. In some cases the spleen becomes enormously enlarged; it is seen to bulge forward below the ribs, and it extends into the hypogastric region and beyond the umbilicus. From its great size it often causes considerable discomfort, due to its weight and to its pressing on other organs and displacing them; one of the most common troubles due to this is palpitation, another being gastric disturbance. The spleen is felt to be hard and resisting; patients suffering from this complaint are found to be sallow and anæmic, they are liable to become faint on slight exertion.

I believe that in all cases of malarial fever there is congestion of the spleen, and that these congestions ultimately tend to cause ague cake, especially if the fever is not treated early. Engorgement of the spleen is most marked in fevers which have a severe cold stage and therefore chronic enlargement of the spleen most frequently follows this class of cases.

TREATMENT.—Unguentum Hydrargyri Iodidi Rubri, which does not easily salivate, is generally used as a local application over the spleen; as it is *very* severe in its action, it should only be used in small amounts at a time, the skin should be well dried before the ointment is applied. Internally—iron and arsenic, and quinine should be given.

◆

Brow Ague or Neuralgia of the supraorbital branch of the fifth nerve due to malaria.

This disease is not uncommon in Africa, but the worst case I ever met with was in England. In this case the pain was more or less periodic in character; one side of the brow only was affected. As internal or local treatment were of no permanent use, a piece of the nerve was excised. When I saw this patient some months later, he said that he was quite well.

Treatment.—Quinine or arsenic in large doses.

Local application of linimentum iodi, linimentum aconiti, chloroform, or blistering fluid.

Excision of part of the nerve.

The most important thing is to remove patient to a non-malarious climate for a time at any rate.

Hypodermic injections of morphine usually have to be given to allay the severe pain. Trousseau advises the local application of atropine; or the removal of the skin by ammonia, and the application of morphine to the raw surface.*

◆

Renal Complications.—Some amount of congestion of the kidneys is very common in cases of West African fever. That acute nephritis with hæmaturia may complicate an attack of fever there can be no doubt. It is certainly liable to follow on blackwater fever and is then probably due either to chill or to the irritation set up by the passing of large quantities of hæmoglobin through the kidneys, possibly also by the extreme acidity of the urine.

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* Trousseau's *Clinical Medicine*. Vol. 1, Lecture 17, page 496.

Treatment.—Mustard plasters should be applied to the loins. The bowels should be kept well open, and the patient should have plenty of bland mild drinks, such as milk, barley water, &c.; diuretics should not be given, but perspiration must be encouraged.

Of course an acute nephritis is liable to lead to chronic kidney disease: when this is once established the patient should leave Africa altogether.

◆

Chest Complications.—It very frequently happens that in the course of an ordinary attack of fever, patients develop slight bronchitis and pulmonary congestion. Acute pneumonia occasionally complicates otherwise mild attacks, but when it does, the case at once becomes very serious. In one case the patient suffered from ordinary fever without dysentery, he then developed abscess of the liver, this was opened, but pneumonia followed and he died from it.

Treatment.—These complaints must be treated in the ordinary way; when they come on during an attack of malarial fever, the fever rather than the particular complication is to be treated.

◆

Dysentery.—There are many cases in which dysentery and malaria are intimately associated.* In one case a white man suffered from ordinary malarial fever, this was followed by diarrhœa, which ran on to dysentery; an abscess formed in the right hypogastric region, probably due to a small perforation. This abscess was opened. When the patient was well recovered he had a sharp attack of malarial fever which nearly killed him; he was sent home, and after a long holiday returned well and strong to his work.

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* Fothergill says: "At other times, instead of an attack of fever, an attack of dysentery is the consequence of malarial poisoning."—*Practitioner's Handbook*, page 213.

TREATMENT.—Quinine in addition to the usual remedies for dysentery will be required.

◆

LIVER COMPLICATIONS —One effect of malarial poisoning is enlargement of the liver due to congestion, the enlargement is not as a rule great; repeated congestions are liable to be followed later on by contraction and cirrhosis.

"Repeated intermittent fever is another supposed cause of cirrhosis of the liver, but probably it does not operate alone."*

Chronic liver troubles cause varying symptoms such as chronic slight jaundice, dyspepsia and, later on, hæmatemesis, ascites, and anasarca of the limbs. I have only seen one or two cases of cirrhosis and these have been noted in men who, in addition to suffering from malarial fever, have taken too much alcohol; but it is quite certain that in some cases well marked malarial cirrhosis has been noticed in people who have not taken alcohol to any great extent.†

Another complaint which I believe may be due to malaria is abscess of the liver.

TREATMENT.—When the liver trouble is marked the great thing is to remove the sufferer from malarial influences. If ascites supervenes then the patient must be tapped; in one case I removed large quantities of fluid from the abdomen of a patient, amounting altogether to several gallons.

When simple congestion is present, poulticing and gentle purgation gives most relief. If an abscess forms it must be opened at all costs.

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* *Text-book of The Principles and Practice of Medicine.*—Third edition, vol. II, page 369. Fagge & Pye-Smith.

† See article in the *Lancet*, February 14th, 1891, by Dr. A. H. Bampton.

Effects of Malaria on the nervous system.—There can be no doubt that malarial poisoning of the blood produces a profound effect on the nervous system. Fayrer says:*

"An ague clearly is a neurosis in the outset; the materies morbi, acting on the central nervous system, sets up vaso-motor irritation, which causes dilatation and engorgement of the vessels supplied by the splanchnic, the skin and external parts being brought into an opposite condition. The result is the rigor and pallid shrunken skin, whilst there is internal congestion, which is followed by reaction, when the skin and exterior parts become vascular, the signs of pyrexia appear, followed by profuse sweating and then a return to the normal condition takes place."

Patients who have long resided in Africa are liable to serious neurotic symptoms. During an attack of fever it is very common to have pain or numbness along the course of certain nerves. In my own case, in nearly all my severe attacks, there has been marked numbness of the little and inner half of the ring finger., *i.e.*, the parts supplied by the ulnar nerve. Some patients complain of severe pains along the course of the sciatic nerve, others of numbness especially of the inner side of the foot and ball of the great toe.

I have noticed in a few patients a very curious symptom, viz., a kind of nerve transference in which pinching of one part of the body is immediately followed by a sharp localised pain in another. Sometimes, dulling or acute sensibility of the cutaneous nerves is complained of by the patient There is often a tendency for parts of the body to "go to sleep," and at other times "pins and needles" are noted, not only in the limbs, but in almost all parts of the body; some of these symptoms are possibly due to anæmia of the spinal cord. †

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* The Climate and Fevers of India, page 69.

† *Diseases of the Nervous System*, vol. 1, page 297.—Gowers

Amongst other obscure effects, may be mentioned—irritability, torpidity, loss of memory, loss of energy, and brow ague, which has already been spoken of.

A medical man who had become much debilitated by repeated attacks of fever, wrote to tell me that in his last attack he had complete aphasia for several days, during the paroxysms of fever. Dr. Gowers writes in his book on diseases of the nervous system, vol. II, page 827.

"During the course of severe malarial fever singular paralytic symptoms have been met with, especially hemiplegia and aphasia, which are said to pass away under the influence of quinine, and are therefore ascribed to an effect of the malarial poison on the nerve-centres (Grasset). Graver and more lasting symptoms of the same class have been met with in cachectic subjects, and have been ascribed to obstruction of cerebral vessels by pigmentary matter."

It does not appear to be quite certain what the curious symptom called malarial coma is due to, some believe that it is entirely due to the effect of the malarial poison on the nervous system, others hold that it is caused by blocking up of the capillaries in the brain.

Treatment.—This can be of little permanent use as long as the patient remains in a malarious climate.

Slight neuritis is not in itself dangerous, it is a warning, and the patient ought to be removed at once to a temperate climate.

Prognosis.—In malarial fevers generally the prognosis is very favourable.

In blackwater fever and bilious remittent fever the prognosis is as a rule favourable, especially in people who have been in fairly good health and who can be treated early.

Unfavourable signs during an attack of malarial fever.—Among these may be noted hæmaturia, hæmoglobinuria, albuminuria, a tendency to suppression of the urine, extreme collapse with prolonged subnormal temperature, a very persistent high temperature, incessant vomiting and especially when the vomited matters are markedly green in colour, a typhoid condition with sordes on the teeth, dry tongue and dulling of the intellect, prolonged fever with slight sweating stages and short remissions or intermissions, marked jaundice, hurried respiration, quick irregular pulse, delirium, coma, or excessive and rapid enlargement of the spleen. The more the disease resembles a continued fever the more guarded must be the prognosis.

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The fevers of West Africa have got a very bad reputation. I have no hesitation in saying that though West Africa is not by any means a healthy place it is not nearly as bad as it has been made out to be. Malarial fever is not the only thing which kills men in Africa, a large number of the deaths must be attributed to great carelessness on the part of the patients. Unhealthy men who go to Africa are not likely to be improved by the climate; drunkards are not less liable to die in Africa than they are at home. Often people who go to Africa will not adopt any of the precautions which experience has proved to be necessary. The death-rate in Africa from purely malarial troubles is not nearly as high as it is supposed to be, and it will compare favourably with that of some other places which are supposed to be more healthy.

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Diagnosis.—Certain cases of malarial fever may have to be distinguished from other complaints, of these only three will be mentioned here, viz., acute yellow atrophy of the liver, insolation, and yellow fever.

The diagnosis will at times present considerable difficulty on account of the many forms under which malarial poisoning is met with, the disease at one time being so slight that it is hardly noticed, at other times being rapidly fatal. The diagnosis is made all the more difficult by the the fact that malarial fever may complicate, or be complicated by almost every known disease. Dr. Taylor, writes as follows :—

"Pyrexial attacks from suppuration and the hectic of phthisis may simulate ague. On the other hand, in the severe forms of ague, the malarial origin may be overlooked, from the prominence of some local disorder. Thus the comatose form may be taken for apoplexy, and pneumonia or cholera may be diagnosed in other cases."*

◆

ACUTE YELLOW ATROPHY.—In this disease many of the symptoms resemble those of malarial fever. There is jaundice, enlargement of the spleen, and there may be hæmaturia and fever.

The disease comes on as a rule very insidiously, and there is much pain over the liver, the urine always contains bile, the fæces are light-coloured, and there is a tendency to general hæmorrhage, there often being "black vomit" due to blood, and at times there is blood in the stools; fever, if present, is slight, and is not markedly paroxysmal. In most cases of severe malarial poisoning there is also jaundice, and the spleen is always more or less enlarged; the liver, in malarial fevers is usually somewhat enlarged, it certainly is never contracted in acute attacks, whereas in acute yellow atrophy it gets rapidly smaller. As far as I know "black vomit" is very rare in malarial fevers, and the stools are always yellow or brown in colour. Malarial fevers are rarely fatal, whereas in acute yellow atrophy the disease almost always kills the patient. To contract malarial fever one has to reside in a malarious climate, but acute yellow atrophy may attack people who have never been exposed to malarious influences. Women are less liable to severe attacks of malarial fever than men (probably because they are able to take better care of themselves) but they are much more liable to suffer from acute yellow atrophy of the liver. Acute yellow atrophy is, unlike malarial fever, a very rare disease.

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* The Practice of Medicine, page 81.—Frederick Tayler.

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INSOLATION.—In certain cases it is quite impossible to distinguish sunstroke from acute malarial poisoning—two such cases have occurred within the last six years on the Niger, unfortunately I did not see them, but from the report I received from the Medical Officer I agreed with him in regarding them as belonging to the class of cases which are mentioned by Sir Joseph Fayrer in his book on the climate and fevers of India (page 96.) He says "Under certain circumstances the symptoms are so sudden and severe as to be mistaken for insolation, and the patient, being overwhelmed at once by the poison, passes rapidly into a state of fatal coma."

It is only necessary here to state that in these obscure cases, treatment, rather than diagnosis, is what is wanted. All such cases should be treated as if they were due to malarial poisoning of a very severe type, in which the temperature is abnormally high. The temperature must be reduced by using ice, cold packs or cold baths; perspiration should be brought on by giving antipyrin, the bowels should be rapidly opened, and quinine ought to be given hypodermically or by the rectum.

YELLOW FEVER.—By far the most important and difficult subject for careful diagnosis in West Africa is the distinction between certain cases of malarial fever and yellow fever.*

Though yellow fever is not common in the Niger district there can be no doubt that at times it appears in an epidemic form; we have recently had such an epidemic and some years ago there was a similar outbreak. Though West Africa seems to have been the original home of yellow fever, as far as I know it is not now endemic. In the last epidemic which was limited to the sea coast, the disease can I believe be clearly shewn to have been imported from America probably through the medium of refuse matter.

For a full and accurate description of yellow fever, and also for many hints as to the differential diagnosis between it and malarial fever, I am principally indebted to Sternberg's report.† I may mention that I have never seen a case of yellow fever, but from the reports I have received of cases which occurred very close to Akassa, the port of entry to the Niger, I have no doubt but that the recent epidemic was one of true yellow fever, and not blackwater fever as has been supposed by some. A medical friend, who eventually fell a victim to the disease, wired "true yellow fever has broken out," and he had seen many cases of blackwater fever, amongst others, my own.

In the first place it must be granted that in some cases it is almost impossible to say whether the patient is suffering from one or the other of these diseases; for while a typical case of yellow fever may be easily distinguished from a typical case of remittent or intermittent fever, it must be remembered that African malarial fevers are usually very irregular in their course, and that at times they tend to become continued fevers. It is quite certain that one disease may complicate the other.

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* "The *fièvre bilieuse hématurique* is not always easily distinguished from yellow fever in countries where both diseases prevail."—*Text-book of the Principles and Practice of Medicine*, Third edition, vol. I., p. 337.—Fagge and Pye-Smith.

† Report on the etiology and prevention of yellow fever by George M. Sternberg, Lieut. Col. and Surgeon, U.S. Army.

The final decision must rest, not on the presence or absence of this or that symptom, but on a careful consideration of every symptom, in addition to which the blood must be examined microscopically.

Yellow fever is a continued fever of *one* paroxysm; the paroxysm is followed by a period of calm; the pulse usually becoming abnormally slow; the onset is very sudden* and the highest temperature is reached almost at once; from this time the temperature *gradually* descends, there being seldom any important exacerbation, and if present it is probably due to malarial complication, or some other disturbing element. From the first there is a marked tendency to suppression, albuminuria is constant, and complete suppression is not uncommon; hæmaturia and hæmoglobinuria are rare. The eyes are very bright and there is usually marked conjunctival congestion. Jaundice is frequently absent, especially during the earlier part of the disease; Hertz says:—"jaundice belongs to the latter stages of yellow fever"; and Troussau writes:—

"There is one palpable point on which it is easy to agree; that is, the absence of jaundice in yellow fever; in upwards of a thousand yellow fever patients who came under my observation, not one had jaundice." †

The incubation of yellow fever is short as a rule, being from two to five days.

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* In yellow fever, the extreme violence with which the fever sets in, the great severity of the pains in the loins, and the indescribable discomfort of which the patient complains, can only be compared to the similar symptoms which usher in an attack of confluent smallpox. TROUSSEAU'S *Clinical Medicine*, Vol. IV., p. 322.

† TROUSSEAU'S *Clinical Medicine*, Vol. IV., p. 321.

Quinine does little or no good.

Melæna, hæmatemesis, and general hæmorrhagic tendency are fairly common; "black vomit" being very usual in fatal cases. The temperature after death frequently rises, and jaundice may be developed at the same time.

Bilious vomiting is absent except perhaps at the onset of the disease, and this is succeeded by watery vomiting; this in grave cases, being later on replaced by black vomiting. The spleen is *not* affected. In nearly every case the disease is protective; convalescence is usually rapid and complete. The prognosis is always grave. When once this disease appears it is likely to spread as an epidemic. The disease is nearly always confined to the sea coast or banks of navigable rivers, and it is infectious in the same way that cholera is, and the germs can be carried almost any distance in the clothes, &c. The tongue is usually narrow parched, red, and pointed.

No specific microörganism has been found in the blood.

Sternberg says (page 28): "The researches made by myself as a member of that commission showed that in yellow fever there is no microörganism present in the blood of the sick demonstrable by the highest powers of the microscope."

In contradistinction to the above characteristics of yellow fever, malarial fever is a paroxysmal disease, and though in certain cases it may become a continued fever, there are as a rule, several paroxysms.

The highest temperature is not as a rule in serious cases reached at once, the temperature chart usually shews no well marked continuous decending line, but, it is interrupted by intermissions or remissions and exacerbations. The onset of the disease is usually gradual.

There is at first an increase in the amount of urine, a tendency to suppression is very uncommon, and even in blackwater fever the urine is *at first* usually freely passed and complete suppression is rare. Albuminuria without hæmaturia or hæmoglobinuria *is very rare.*

The eyes are usually dull and heavy, intense brightness and conjunctival injection being almost unknown. One paroxysm is in most cases succeeded within twenty-four hours by another, there being no lengthened period of calm.

The pulse is seldom at any stage of the disease abnormally slow, the tendency being for it to increase with the fever.

Jaundice in certain cases, *e.g.* bilious remittent, and blackwater fever is constant; it not being uncommon even in mild malarial fevers.

The incubation is very variable and is usually of some weeks duration.

Quinine is very useful in all stages of the disease. The vomit is bilious throughout, in fatal cases it is often green in colour.

Melæna, hæmatemesis and general hæmorrhage are very rare; even in fatal cases "black vomit" is almost unknown.

The temperature after death falls rapidly, and jaundice is never developed, usually if there has been jaundice, it has begun to clear away before death.

Though the disease is common enough near the sea and rivers, severe cases are very common at enormous distances from them; the disease is not infectious, nor can it be carried in the same way that yellow fever can.

The tongue is usually broad, flabby and furred, even in bad cases though it becomes parched and red, it still usually remains more or less broad.

The plasmodium malariæ is believed to be present in all cases in the blood, at some period of the disease, and when present can easily be detected with a one-sixth in. objective. The disease does not usually spread in an epidemic form, the spleen is always affected, and it is probably always enlarged during some stage of the disease. Convalescence is usually slow after a severe attack of malaria; even if the patient is able to get about, he remains for a time anæmic and liable to fresh attacks, the disease not being protective.

In malarial fever of a severe type there is at times a tendency to delirium, and very often dullness of the intellect, whereas in yellow fever the mind usually remains clear during the feverish stage.

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The Post-mortem Appearances in fatal cases of malaria are usually said to be as follows:—

The spleen in recent cases is enlarged and engorged, in chronic cases it is usually very hard, pigmented and much hypertrophied.

The liver is frequently enlarged and congested, but in old cases it may be contracted and cirrhotic.

The kidneys are large and hyperæmic in recent cases, in old cases they may show signs of chronic Bright's disease.

The brain, like the liver, spleen and kidneys, is frequently pigmented, and the capillaries in acute cases are found to be in some instances blocked with pigment granules.

The gastro intestinal tract is often congested, and may be ulcerated.

The body is generally thin, wasted, anæmic and sallow.

Death is very rare in simple malarial fevers, when they have been complicated by some other disease, such as pneumonia or nephritis, of course a post mortem examination will also shew signs of the secondary disease.

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Precautions.—All people who live in a malarious climate are liable, at some time or another, to suffer from malarial poisoning, but the effects of malaria may be modified by taking certain precautions. I have here noted a few of these which are I believe of importance.

PROPHYLAXIS.—Administration of quinine with a view to preventing the disease. I have met with several medical men who have had greater experience than myself who believe that this is useless if not actually harmful. They contend that either patients become too much accustomed to the drug, or else that early attacks are delayed which had they come on at the proper time would not have been very severe, and would have eventually been protective. There seems to be a good deal to be said in favour of these arguments, but my own experience leads me to believe that quinine ought always to be given with the above view. I think that it is advisable to give six grains of quinine every third day; this is a better plan than giving a smaller dose every day. The bowels should be opened at least once each day. If it is known at what time an attack will probably take place, then just before this time enough quinine ought to be given to bring the patient well under its influence; this will be shewn by headache, deafness and singing in the ears. Of the use of arsenic for the same purpose I cannot speak from personal experience, but I do not, from what I have heard, believe that it is of much value; but as arsenic tends to prevent anæmia, it will undoubtedly make the patient more able to bear an attack of fever. I often use arsenic after a fever, but I have not given it regularly with the idea of preventing fresh attacks. I believe that the adoption of rational precautions, *e.g.*, the avoidance of chills and exposure to the sun, of excessive eating or drinking, of habitual constipation, &c., is of more value than the taking of any particular medicine. After a long journey or other heavy work, a warm bath and a dose of quinine will I believe go a long way towards preventing an attack of fever.

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Drinking Water. The drinking of impure water is probably one of the common causes of attacks of malarial fevers. All water, no matter from what source, ought to be boiled and filtered; when obtainable, it is better to drink distilled water.

Dwelling Houses should be kept clean and well ventilated, but not draughty; it is necessary to have the land near the house well drained, heaps of rubbish should be burned and not allowed to accumulate, and hollows should be filled up with good earth.

In West Africa houses which are built near the sea are often necessarily unhealthy, as the coast is frequently low and swampy; this is especially the case at the mouths of rivers where mangrove swamps are common, and large deltas are formed. All houses ought to be well raised from the ground, even an elevation of a few feet has been found to be beneficial, as it is probably the case that the nearer the ground the more concentrated is the malarial poison; the upper rooms only should be used.

Dwelling houses should be built well away from swamps and lakes, and on the highest ground obtainable, but they should not be in the line of winds blowing from a malarious quarter.

The underbush should be cut down and burned, and instead of having gardens near the house, the grass ought to be allowed to grow, this grass should of course be kept short cut.

Well grown trees are useful if not too near the house, but their lower branches should be removed, so as to allow a free current of air; where there are only a few trees, suitable ones such as eucalyptus, beef wood, lime and orange trees should be planted. It is well known that a belt of trees is to a certain extent a protection against malaria; it is also said that running water, by absorbing the malarial poison, is protective.

People living at the foot of high hills are liable to suffer severely from fever on account of the stagnant sub-soil water, and also from being exposed to the winds blowing between the hills.

Everyone who lives in a malarious climate should wear a flannel belt. I believe that this is of great service, but if it is once adopted it cannot be left off with impunity, as the parts would then be very liable to become chilled.

People who are obliged to go out of doors during the heat of the day should always wear a large helmet, neglect of this has led to many serious cases; exposure of the neck to the sun is nearly always followed by fever. If a helmet is not used, then either a Stanley hat or a Terai hat should be adopted.

It is advisable to have an extra thickness of cloth running right down the coat along the line of the spinal column. Clothes ought to be very light, but warm, a singlet and a pair of drawers of light woollen material should always be used.

SANITARY ARRANGEMENTS.—It is hardly necessary to do more than to mention these, but they are very often neglected. Closets ought to be built as far as convenient from the house; the dry earth system is usually found to be the best as water is at times scarce. Quicklime or carbolic powder should be used occasionally.

It is always well to have a portable earth closet in the house at night, so as to avoid exposure to the night air, as between the hours of sunset or sunrise the malarial poison is probably most active.

It is advisable to bathe at least once a day in the tropics, but if possible the bath should have the chill taken off, and the skin should always be well rubbed after bathing.

Diet, etc. – Alcohol except in small amounts is injurious. I think that champagne, claret, hock and perhaps light lager beer are useful in moderation, in all cases; claret is the best of all drinks for those living on the West Coast of Africa. It has been said that taking of even a moderate quantity of alcohol tends to bring on blackwater fever; after six years experience I have come to the conclusion that this is *not* the case. If any spirit is taken, whisky or gin, well diluted, is the best. Brandy, sherry or port, should not be taken unless ordered by a medical man.

Great harm is done by eating too much animal food; it is advisable always to have a good supply of ripe fruit and green vegetables.

It is important never to begin work in the morning without first having a light breakfast; meals ought to be taken at regular intervals.

The too frequent use of purgatives is to be guarded against. People who have pigmentation of the skin, often think they are bilious when they are not, and injure themselves by the constant use of opening medicines.

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Fig. 1.

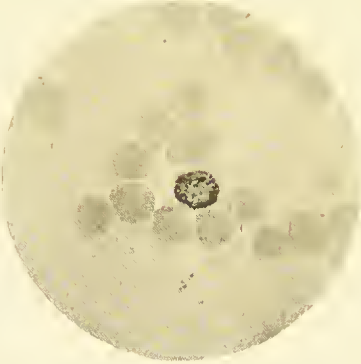


Fig. 2.

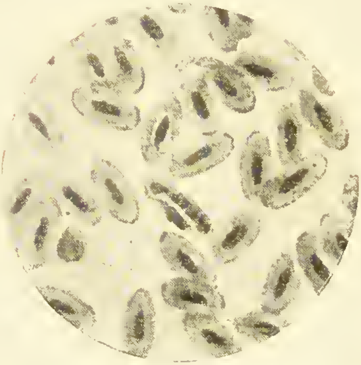
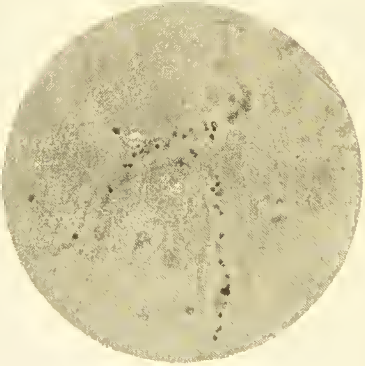


Fig. 3.



DESCRIPTION OF FIGURES.

These figures are copied from photo-micrographs taken by Dr. E. O. Hopwood and Mr. A. Ellis Durham, of the London Fever Hospital, and the Author.

The slide from which figure 1 is taken was prepared by Dr. Hopwood from the blood of a patient who was under the care of Dr. Washbourn at the London Fever Hospital, suffering from scarlet fever; during convalescence he had an attack of ague, from which disease he had previously suffered while in South Africa (Transvaal). The slides from which figures 2 and 3 are taken were prepared by Dr. Washbourn at Rome.

Figure 1 shews several red blood cells which are more or less altered in shape. in the centre of the figure is seen a corpuscle which is nearly wholly occupied by a dark pigmented granular body — the plasmodium malariæ; the plasmodium was stained with methyl-blue, the red corpuscles were not stained and are therefore of a much lighter colour than the malarial microörganism.

Figure 2 shews the oval cells from the blood of a pigeon; the cell in the centre has its nucleus pushed to one side by a well marked pigmented sausage shaped body, which is a parasite of a similar nature to the plasmodium malariæ, and which is frequently found in pigeons living in the Roman Campagna.

Figure 3 was taken from a thin section of the brain of a patient who died from malarial coma; it shews a vessel and its two branches more or less blocked up by pigment granules. Of course in a photo-micrograph it is impossible to shew plainly the vessel, brain cells, and all the pigment granules at the same time, as they are on different planes, but in the figure a few brain cells and the vessel can be faintly made out.*

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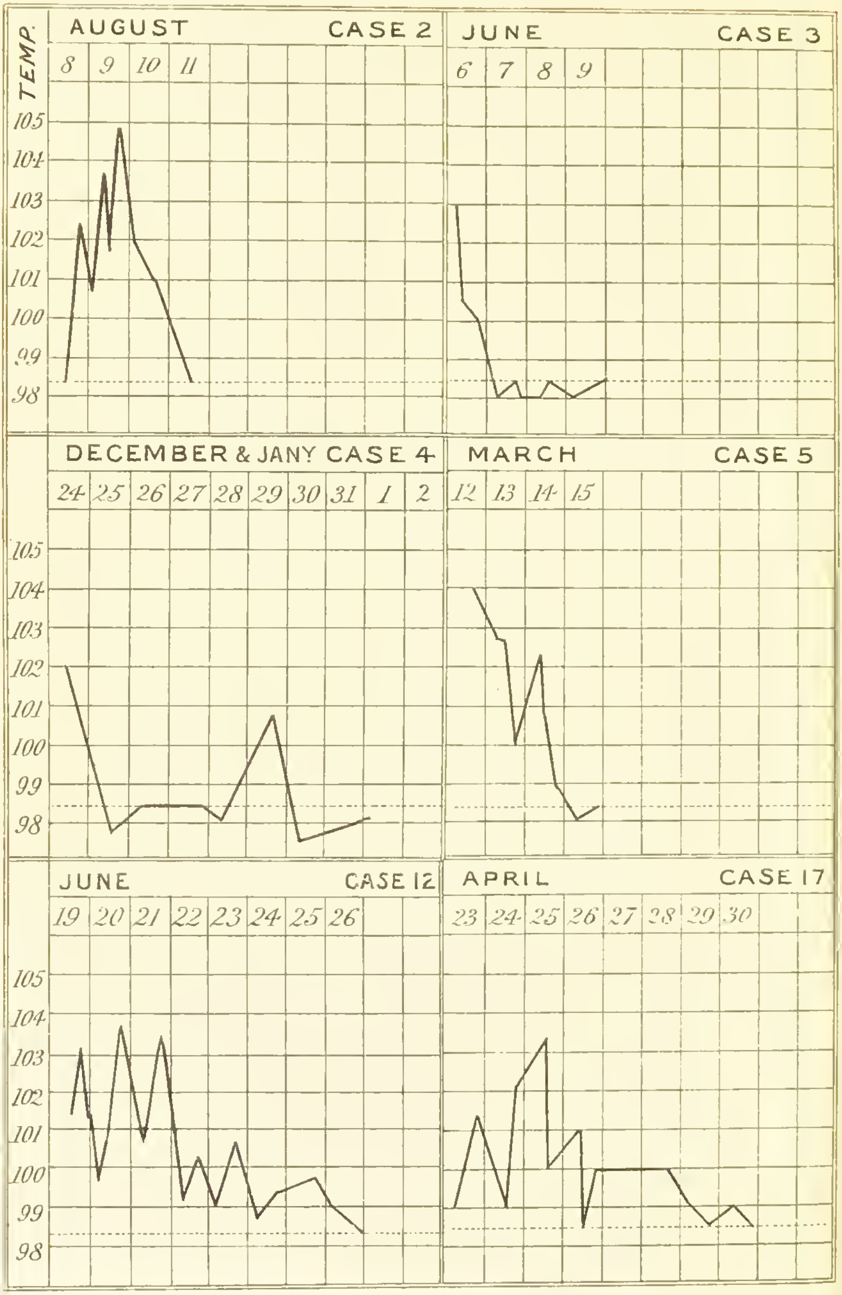
* The specimen from which this section was cut was given to Dr. Washbourn by Dr. Amico Bignami, of Rome.


TEMP.
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CASE 2
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DECEMBER & JANY
CASE 4
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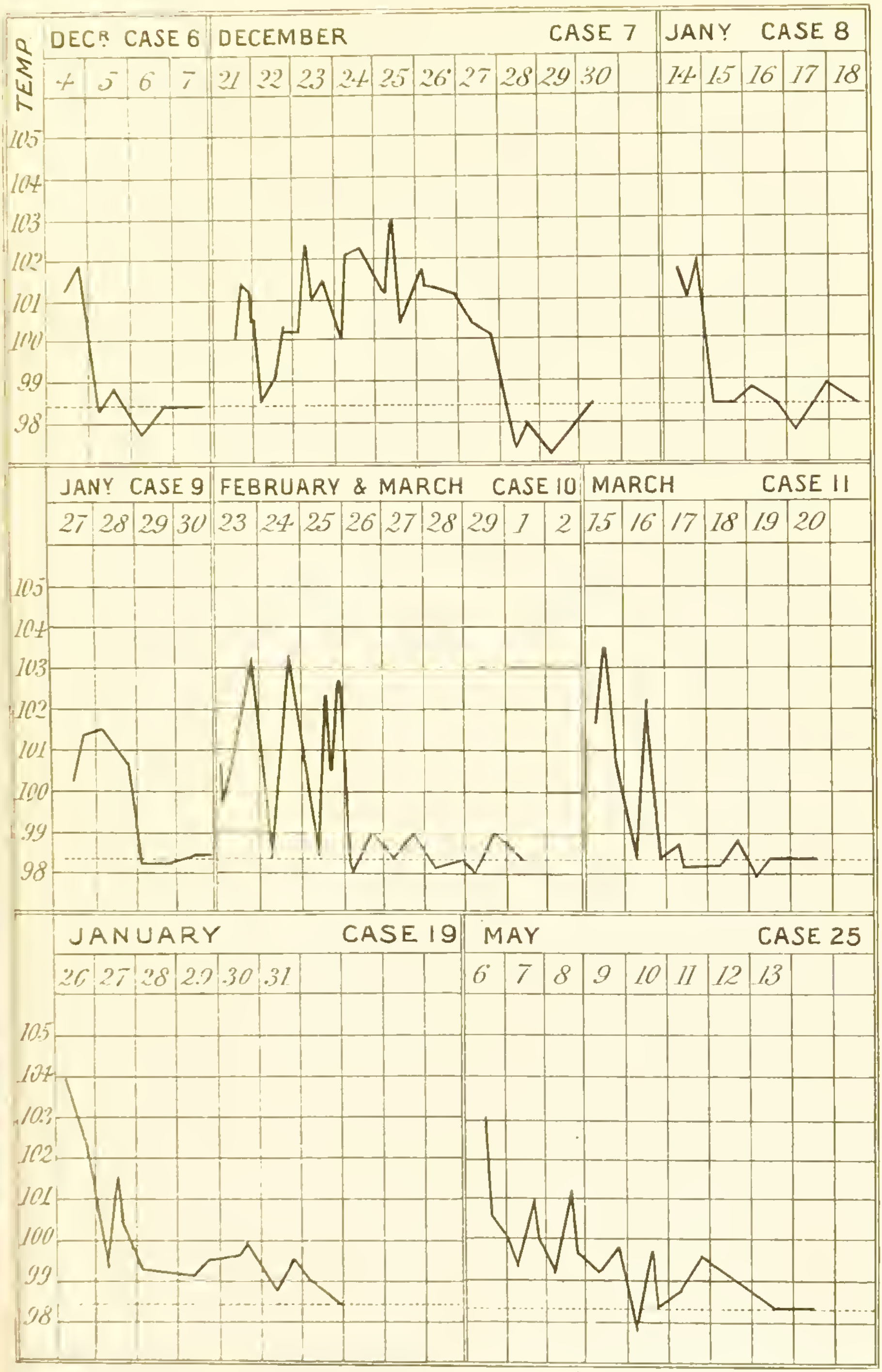
TEMP
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4 5 6 7
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JANY CASE 8
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JANY CASE 9
27 28 29 30
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23 24 25 26 27 28 29 1 2
MARCH CASE 11
15 16 17 18 19 20
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26 27 28 29 30 31
MAY CASE 25
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NOTES ON SOME CASES

OF

MALARIAL FEVER.

I HAVE thought that a short history of some cases seen by myself or my friends on the Niger, would be of interest to the reader; and, as by far the most noteworthy and rare cases met with are those in which there is hæmaturia, hæmoglobinuria, or a very high temperature, I have dealt principally with such.

CASE I.

A—— B—— a healthy young European, about six weeks after his arrival on the West coast of Africa, had his first attack of fever. The earliest symptoms noticed were a slight tingling of the skin, yawning, and a little chilliness down the back. His tongue had a slight white fur over it. The symptoms gradually got worse, in a short time he complained of shivering, began to vomit, had great pain and throbbing in his head, and slight pain in his back. The skin, though warm to the touch, to the patient felt very cold. The least draught aggravated the symptoms, and the urine was pale and increased in quantity. The cold stage soon passed off and the patient felt very hot; he was light headed and talkative, at the same time the pain in the head and the vomiting, became worse.

The urine which was acid caused considerable scalding; the tongue was furred but not dry; the pain in the head was intolerable, but was somewhat relieved by the application of cold water; bilious vomiting was frequent. About six hours after the first symptom the patient began to get markedly better; the vomiting became less frequent, and there was a gentle perspiration which rapidly became profuse. The patient experienced great relief directly the perspiration came on, and was soon able to retain drinks of milk and soda. The water was very high in colour, and was scanty in quantity. In about twenty-four hours after the first symptom there was a return of the fever, the first sign being slight chilliness down the back. Twenty grains of quinine had been again given, and the patient's bowels were freely opened. The vomiting and all other symptoms were less, but the patient was extremely weak, the vomited matters were of a yellow colour, the motions being dark brown. Fifteen more grains of quinine were given. On the third day the symptoms returned as before. On the morning of the fourth day the temperature was normal for the first time, and there was no return of the symptoms, though the water remained high coloured for some time, and it was some days before the patient felt quite strong again.

In this case there were no serious complications, the vomiting being the leading symptom; there was some pain in the spleen and tenderness on pressing over the liver, but no albumen in the urine.

More than a year after the first attack the patient had another and more serious illness; while suffering from a slight fever he went out in the sun on a very hot day in an open canoe, and in the evening was taken with shivering and most severe vomiting, the latter was so distressing that for some time he absolutely refused to take medicine of any kind. The temperature remained high and at the end of the second day the patient was jaundiced all over his body, he had slight pain in the hepatic and splenic regions, and there was considerable aching about his kidneys; the urine was now dark red in colour, and on standing threw down a heavy chocolate-like deposit. There was persistent greenish vomiting—the patient was now suffering from the so-called blackwater fever. Quinine in full doses was given—no antipyrin being used. For two days he was very ill, then the water rapidly became clearer, and in eight days he was well, though rather weak and prostrate. The spleen was somewhat enlarged, but no enlargement of the liver was made out; on the 8th day no albumen was found in the urine.

During the next 16 months this patient had several attacks of fever, and in five of them there were blackwater symptoms – *i.e.* jaundice, dark red urine, and occasionally green vomit. He went home, after staying on the coast nearly two years and a half. Soon after going on board he caught a cold and his urine became bloody for two days, but there was no marked jaundice or vomiting. About three months after his first arrival on the coast A—— B—— had been compelled to go on business to Madeira, and while there he twice suffered from intermittent fever. While in England, on his holiday, he also twice suffered from a sharp attack of fever, but his urine never became red. After spending about 8 months in England the patient returned to Africa having been pronounced perfectly sound, there being no enlargement of the liver or spleen, and no trace of albumen in the urine. He stayed in Africa for two years and eight months, and during that time he had at least four attacks of blackwater fever, besides some feverish attacks, in which there was, at times, hæmaturia. Returning to England he remained there six months, and during that time had not a single attack of fever.

This patient attributes his blackwater fever to the fact that, while suffering from a remittent fever, he exposed himself to the sun on a very hot day. It is noticeable that he had intermittent fever a long time before his first serious illness.

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CASE 2.

(*See Chart, Case* 2).

A medical friend has given me the following notes of his own fevers:—

Dr. B——, 25 years old, previously healthy, arrived on the Niger, April 2nd, 1890. First fever came on April 28th. After that, had irregular intermittent fever nearly every month. Returned to England, September, 1890. Arrived in Africa, December 25th, 1890, having had several attacks of fever on both voyages.

December 27th, had blackwater fever for the first time —recovered quickly. At the end of March, 1891, had second attack of blackwater fever while travelling in the Western Soudan. Returned to England, had one attack of simple hæmaturia, at the end of August while at Eastbourne, and another in December while in Tunis; March, 1892, had a third attack of hæmaturia at Sierra Leone; May, 1892, had another attack of hæmaturia on the Niger. During these four attacks of hæmaturia, there were no marked constitutional symptoms, and there was no fever of any importance.

August 8th, 1892, while in West Africa, he caught a chill in the afternoon, felt uncomfortable with aching of the limbs; at 5 p.m. took a purge and ten grains of phenacetin; did not perspire freely.

August 9th, after a somewhat restless night, the temperature had fallen one degree and a half; bowels freely opened; while at stool felt somewhat chilled. Took quinine, 20 grains, at 10 a.m. Water noticed to be of a dark reddish colour; skin hot and dry; urine became porter coloured. After taking antipyrin, temperature fell to 101·8 by about middle of the afternoon; a little later, had a slight rigor, and the temperature rose again. Took six grains of calomel and fifteen grains of quinine. Temperature gradually fell towards evening; urine rather darker in color and of a thick consistence; frequent desire to pass water, and some difficulty in micturition; great exhaustion and frequently distressing retching all through the night, but there was no actual vomiting. There was general jaundice. Bowels moved by an enema; motions were quite black and mixed with a darkened fluid, evidently blood.

August 10th, urine rather lighter in colour; the skin was still jaundiced, and the temperature falling. From this time, the patient began to get better.

CASE 3.

(*See Chart, Case* 3).

Blackwater Fever.—First Attack.—Recovery.—A—— B——, European, had been more than a year in Africa, during which time he had had 9 attacks of fever, the only severe one was the first. Family history good, had always been considered a healthy man, had scarlet fever when a child, was a very heavy smoker and almost an abstainer.

He had not been feeling well for a week and it had been noticed that he looked sallow, thin and weak.

Felt very ill on the evening of June 4th, but went to work on the 5th, after taking his early breakfast, which he vomited almost at once; later on he took three pills which purged him.

6th, noon.—Said he had had a restless night and could not take any food yesterday evening, and that he had had severe headache and pain in the spleen.

He had general jaundice, the conjunctivæ were markedly yellow and objects appeared to have a yellow tinge.

Urine, dark red in colour, sp. gr. 1008, slightly acid, contained $\frac{1}{6}$ albumen. The spectroscope shewed two bands of reduced hæmoglobin.

The tongue was moist, broad, furred and bile stained.

The patient was perspiring freely and the skin was said to be yellower than at 6 a.m.

There was pain over the liver and spleen, but no perceptible enlargement. The bowels were well opened, the motions being of a dark yellowish brown colour.

Vomiting constant and green in colour.

Evening.—Jaundice more marked, patient complained of colicky pains and flatus; he also said that there was a dull aching pain over the kidneys.

He said that he had not felt feverish, but that he had a shivering fit last night, and felt a sharp chill this afternoon. The urine was very dark, the patient moaned constantly, he said that vomiting relieved him, he had a good deal of pain in the spleen, there was also some diarrhœa.

Towards night he became rather dull and heavy, but the diarrhœa and vomiting were less severe.

7th.—The skin was of a darkish yellow colour tinged with green. During the night the patient slept fairly well, but at times vomited green bile; now felt easier and had taken a little nourishment.

Noon.—The urine not so dark, contained $\frac{1}{5}$ albumen; the vomit of a lighter green colour.

The spleen reached one inch below the costal margin, but there was no pain either in it or the liver.

Champagne "turned acid" the patient said, and made him vomit at once.

Evening.—Jaundice less; urine not so dark, thick brown sediment deposited.

The vomit yellower in colour, the patient felt better, soda and peppermint have relieved the troublesome feeling of colic; he had a refreshing sleep, and vomiting was not so frequent.

8th.—The urine much lighter, little or no blood colouring matter in it, and only a small amount of albumen; it deposits a cloudy precipitate of urates; tongue moist and less furred; spleen smaller; there was some pain on pressing over it.

Evening.—Patient had slept well; after passing a large motion he felt much better; the pulse stronger; there had been little or no vomiting to-day and there was less jaundice.

At night the patient felt very much exhausted, but had taken milk, arrowroot and nourishing soups, and was evidently much better.

9th.—Had a good night, and did not vomit. The urine straw-coloured, acid, not albuminous. Sp. gr. 1012.

10th. Still improving; from this day he began to get much better, the urine was passed more freely, and the jaundice disappeared gradually.

During the attack 50 grains of quinine were given; chlorodyne was administered once or twice, and the patient was fed constantly. Bile was never detected in the urine.

The urine measured 30 fl. ozs. on the 6th; 36 fl. ozs. on the 7th; 34 fl. ozs. on the 8th; and 40 fl. ozs. on the 9th.

The temperature was never very high and it fell rapidly to normal, as it often does in cases of blackwater fever.

No enlargement of the liver was detected, and the albuminuria and hæmoglobinuria were of short duration.

The most distressing symptom in this case was the vomiting. This patient refused to go home, but was sent up the Niger for a change, and was ordered to take iron and quinine every day. During the attack the pulse varied from 72 to 84, and the respirations from 18 to 20.

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CASE 4.

(*See Chart, Case* 4.)

BLACKWATER FEVER; SECOND ATTACK. RESULT: DEATH. A—— B ——, had been in Africa nearly two years, had several attacks of fever, and some months ago had blackwater fever. Had suffered a good deal from boils since he had been in Africa.

Since his last attack of blackwater fever, it had been noticed that his skin had been somewhat darker than it used to be, and his general health had not always been good; but he said, that on the whole, his health had been better than it was during his first year in Africa. He had had some slight attacks of fever, but complained most of constipation and indigestion.

About two weeks before the onset of his final illness, he suffered a good deal from indigestion and debility, but had no fever, and soon became much better.

Dec. 23rd.—This morning he said he felt quite well, took his breakfast and went about his work.

First felt ill about 3 p.m., took some purgative medicine and went to bed.

5 p.m.—While sweating he got up and walked about the house for ten minutes; he began to feel chilly at once, went to bed, was unable to take food and began to vomit yellow and green matter—he said that vomiting always relieved him for a time.

24th.—The urine early this morning was dark brown, later it became a dark red colour.

2 p.m.—I saw him for the first time, he said he had vomited a great deal and that he had had his bowels freely moved after taking six pills! Temperature 102, P. 86.

He was all over of a dark greenish yellow colour, said that objects looked yellow.

The urine had the appearance of stout and port wine mixed, in bulk it looked nearly black, the froth had a dirty red tinge. The bowels were well opened, the skin hot and dry and the patient vomited a great deal, he felt much relieved after a 10 gr. dose of antipyrin which brought on sweating. The tongue was moist, furred and indented at the edges, the pulse kept under 90, but was very weak in character; only 25 fl. ozs. of urine had been passed in 24 hours.

25th.—Up with him all night, as he had been very ill and restless. He vomited constantly, and was not passing any water; a little drawn off by a catheter was darker and dirtier than that passed yesterday, and it left a fine coffee-like deposit, I drew off altogether 7 fl. ozs.; there was no stricture.

He constantly wanted to hiccough, this was stopped by the inhalation of Spiritus Ammoniæ Aromaticus.

The colour of the skin and eyes was darker; the vomit which had looked like green paint, was now a mixture of yellow and green, but never of a black colour.

It is difficult to say when jaundice first came on, it was first noticed about 10 a.m. on the second day, but probably came on some hours earlier.

The patient vomited an enormous quantity of bile and strained a great deal—the retching was lessened by giving him plenty of fluid.

Evening.—The bowels had been opened by an enema. The vomiting had been almost constant, relief for a short time being obtained by giving a draught containing chlorodyne; subnitrate of bismuth and dilute hydrocyanic acid had no effect on the vomiting.

26th.—The skin and urine not quite so dark, but very little urine passed. There was still a great tendency to hiccough, the temperature remained about normal and the bowels open, but there was frequent vomiting.

27th.—Had a restless night, I drew off 7 fl. ozs. urine which contained much albumen, the water was much lighter in colour and the jaundice less; the skin acted well, vomiting frequent; the patient was constantly fed with nutrient enemata.

28th.—Patient perspired freely, I drew off 7 fl. ozs. of straw coloured urine, it was loaded with albumen but contained no blood; the bowels open, the patient in a very prostrate condition, the skin cold and clammy.

29th.—Drew off 5 fl. ozs. urine; there was still a great deal of vomiting; the patient had some confusion of intellect.

30th.—Vomiting continued, the patient had a restless night and passed little or no urine ; at times he squinted, and had cramps in legs and shoulders, and he felt that he was dying, complained a good deal of heaviness of his limbs.

Hiccough not stopped by Spiritus Ammoniæ Aromaticus but Chloroform internally relieved it; it was much more frequent to-day than previously.

Evening.—Pupils very small but reacted to light, the skin cold, the breathing heavy and blowing.

At times the patient was quite comatose; at others more or less sensible and irritable; he vomited frequently though not quite so often as before.

31st.—Felt a shade better this morning, he had a fairly good night, there was almost total suppression of the urine.

Midnight.—The skin now was only of a sallow colour. There was no œdema of the legs; the patient was more or less comatose, and evidently dying ; there had been some twitching of the limbs, and vomitting had been frequent.

Jan. 1st.—He died at 7 a.m. in a comatose condition.

The urine, under the microscope, shewed very few blood cells. Spectroscopic examination shewed the presence of hæmoglobin. There was no bile present in the urine. During this illness, the patient was fed constantly; quinine and other drugs were administered freely. The temperature on the second day was 102 ; it rapidly fell, so that on the next day it was subnormal. It remained about normal till the seventh day, when it rose to 100·6; after this it again fell.

The pulse varied from 86 to 76.

In this case, it is evident that the cause of death was suppression of the urine due to nephritis.

The tendency to suppression was noted very early in the disease; probably this patient had a tendency to kidney mischief—having had scarlet fever as a child, and suffered from a previous attack of blackwater fever as well as several attacks of malarial fever. The patient during his illness complained a good deal of heaviness of the limbs; his statement that he felt quite well on the morning of the first day was, I believe, incorrect.

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CASE 5.

(*See Chart, Case* 5.)

BLACKWATER FEVER—FIRST ATTACK. RESULT: DEATH.

The patient had been out over a year on this his first voyage. He had recently suffered from considerable pain and suppuration, due to a diseased piece of bone which had to be removed from his finger. He had had several attacks of fever.

He was a very moderate drinker and smoker, not very robust, had always looked pale and thin, and said he had felt quite faint at times; he was liable to vomit heavily whenever he had had fever, he was very anæmic; he had not been feeling well for some days before 11th, when he really began to be very ill. Though doing his work he had at times to give up as he felt feverish and vomited; it is probable that he began to be ill first on March 4th. He said that from March 11th to 13th, the day on which I saw him first, he was very feverish and vomited a great deal.

March 12th, 7 p.m., his evening temperature was 104, and it is very probable that he became jaundiced about this time.

March 13th.—I find that at 5 a.m. he rushed out of bed in an excited state, as he heard that some provisions had been stolen by the labourers; on his return, his water was seen to be of a dark red color, his skin was yellow before he went out of the house.

The urine looked almost black in bulk; bright red by transmittent light; on standing it threw down a dirty bath-brick like precipitate. He said that on the 11th, he took ten grains of quinine, and 15 grains on the 12th, but that he had been very sick and probably did not keep the quinine down long; his bed clothes were stained with vomited matters of a yellowish green colour.

For 24 hours he had felt too sick to take any nourishment; he had taken a mixture of lime juice and water frequently, but it had always made him vomit. He informed me that he had three attacks of shivering on the 12th.

10 a.m.—The patient was extremely ill, completely jaundiced, vomited frequently, but was occasionally able to keep down milk and soda. Champagne made him vomit at once.

He had severe pains in his kidneys for which I ordered a mustard plaster to the loins, and another one over abdomen to try to relieve the vomiting.

He had constant pain over the liver, and some aching in his legs; passed a large brownish yellow motion; the vomiting continued—the vomited matters being of a greenish yellow colour.

5 p.m.—The skin was very yellow and had a marked greenish tinge; the urine looked like stout; contained albumen, was acid, sp. gr. 1012.

12 night.—Patient drowsy and restless, skin felt cool; he had a cold perspiration and said that things looked yellowish; the vomit was of a dark green colour.

He lay in bed in a prostrate condition, was too weak even to sit up to drink, linen was markedly blood stained by the urine.

He had passed about 35 fl. oz. urine in 24 hours.

A mixture containing morphine and dilute prussic acid relieved his vomiting for a time; ice and iced water also checked the vomiting, but not for long; soda and brandy in small quantities could be retained.

He had pain on pressure over the liver spleen and kidneys.

14th.—Had a bad night and vomited a great deal.

At noon he was in a very collapsed condition, and had been a little light headed, but was more or less sensible when spoken to.

At 6 a.m. passed 10½ fl. oz. urine, very dark red in colour, sp. gr. 1012, loaded with albumen, shewing under the microscope a few blood cells and casts, and a good deal of granular matter; the spectroscope shewed hæmoglobin to be present.

Three specimens of urine were inspected by transmitted light, in a thin layer of 1 in. they all looked bright red; in bulk they looked nearly black, the froth being of a pinkish colour; on standing the urine threw down a copious chocolate like precipitate.

12 night.—Was not passing any urine; very weak, and when he tried to sit up fainted; did not vomit so much, but vomit was of a dark green colour.

15th.—The patient was in a torpid condition and getting rapidly worse in spite of nutrient injections, stimulants and quinine, his skin was much less dark than it was the previous day.

At 10 a.m. as he was apparently dying, I injected into his median basilic vein 20 fl. oz. saline fluid; he rallied after this, and was able to swallow a little brandy and milk, and only vomited twice slightly.

At 4 p.m. he became much worse, was quite comatose, and died about 5 p.m.

The temperature in the rectum immediately after death was 98·4; no water had been passed since the morning of the 14th.

The pulse stopped before the breathing. Injection of ether proved of no service. The patient had been fed constantly by the rectum and quinine had also been given freely in the same manner.

I think that the patient had an ordinary attack of malarial fever, which became severe on account of his not lying up, and I believe his case was much aggravated by taking a chill on the morning of the 13th. I noticed when I cut through the skin that the blood was of a dirty brown colour; some little difficulty was experienced in picking up the vein, on account of the patient's bloodless condition.

The pulse on the 12th and 13th, kept between 80 and 90, after that between 120 and 130; the respiration was about normal on the 13th and 14th, on the 15th it rose to 38.

Though there was some suppression of urine, that was not of itself sufficient to account for the patient's death; probably it was due to several causes, the principal one being shock and profound anæmia, brought on by the rapid and enormous destruction of the red blood cells; possibly also there was extensive blocking up of the cerebral capillaries.

This patient like the last complained of pain and heaviness of his legs.

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CASES 6–11.

(*See Chart, Cases* 6-11.)

Short Notes on six consecutive attacks of fever in the same patient, the fifth shewing well marked hæmoglobinuria.

Case 6.—A—— B——, is a healthy European; this is his second visit to Africa; he is a very moderate drinker and smoker; during his last stay in Africa he had several attacks of fever which were not of a severe character. His spleen is slightly enlarged, otherwise he is quite sound; he has never had blackwater fever.

December 4th.—The patient has been feeling rather unwell for 48 hours.

4 p.m.—The skin is hot and dry; 10 grains of antipyrin produced profuse perspiration. 10 grains of quinine were then given.

December 5th.—Fifteen grains of quinine were given and the patient at night said he felt much better.

December 6th.—The patient has had a good night; he is slightly jaundiced and complains of feeling bilious. The bowels were well opened and he took 10 grains of quinine; from this time he improved rapidly, and was ordered to take iron and nux vomica; this is his first attack of fever since his return to West Africa.

During this attack the pulse never rose above 86.

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Case 7.—December 21.—A—— B—— began to be ill again; says that he has been feeling general malaise for several hours; has taken 10 grains of quinine and 10 grains of antipyrin.

December 22nd.—Patient is only feeling slightly unwell, he has taken 20 grains of quinine and 20 grains of antipyrin to-day.

December 23rd.—The urine was passed freely, and contained no albumen, sp. gr. 1020. The patient took to-day 10 grains of antipyrin and 20 grains of quinine.

December 24th.—Pulse keeps about 68; patient to-day took 15 grains of quinine and 15 grains of antipyrin.

December 25th.—Says that he has had a fairly good night and that the antipyrin soothed him; he passes urine freely: it contains no albumen, sp gr. 1030. There is some slight jaundice, the tongue is moist and furred; had a slight shivering fit this afternoon, this was followed later on by profuse perspiration, after this he felt very faint when he tried to sit up; to-day he has taken 25 grains of quinine.

December 26th.—Feels better, and has taken 15 grains of quinine and 15 grains of antipyrin.

December 27th.—Has had a good night and feels much better; the urine is high coloured, contains no albumen, sp. gr. 1025. The tongue is moist and covered with a white fur; complains a good deal of indigestion.

December 28th.—From this time the patient's condition improved; his temperature remained subnormal for two days. He took small doses of quinine as well as a mixture containing iron and arsenic. The pulse kept about 70 during this attack.

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Case 8.—January 14th.—The patient who has been feeling very well since his last attack of fever, began to feel rather feverish to-day; 15 grains of antipyrin and 20 grains of quinine were given.

January 15th.—Fifteen grains of quinine and 10 grains of antipyrin were given to-day, urine is passed freely; there is no jaundice. This evening he feels almost quite well, though somewhat weak.

January 16th and 17th.—The pulse and temperature remained about normal, and 10 grains of quinine were given each day.

January 18th.—Convalescent.

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Case 9.—January 27th.—A—— B——, who had been feeling quite well since his last attack, began to feel feverish and unwell to-day, and 20 grains of quinine were administered.

January 28th.—Fifteen grains of quinine were given; the patient felt weak but did not feel ill.

January 29th.—Temperature stood at 98·2 all day. The patient practically well; quinine and a tonic were given. The pulse during this attack varied from 72 to 80, and in the report it is noted by Dr. Smith as being fairly strong.

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Case 10.—February 23rd.—Up to a day or two ago A—— B—— had been feeling quite well and strong, since then he has felt rather languid and ill and has been constipated; to day he became decidedly ill, he was slightly jaundiced, the pulse varied from 70 to 82; during the day 20 grains quinine were given, and as the patient felt very hot and dry and complained of severe headache, 10 grains of antipyrin were given, this produced free perspiration and relieved the headache.

Feb. 24th.—Morning.—Pulse 70 to 82, patient passed one large dark motion; at 4 p.m. it was noticed he was becoming much more deeply jaundiced, his urine later on became very dark; to-day he took 35 grains of quinine and 10 grains of antipyrin, at night he passed several dark yellow coloured motions. He has been able to take food fairly well and there has been no vomiting.

Between 7 a.m. and 8 p.m. 36 ounces of dark red urine were passed, sp. gr. 1020, reaction slightly alkaline, it was loaded with albumen, the spectroscope shewed the presence of hæmoglobin; but there was no hæmaturia; the skin and conjunctivæ were very yellow, there was some pain in pressing over the spleen, and the patient constantly felt inclined to be sick, and complained of being weak; at 9 a.m. there was a severe attack of shivering which lasted for half-an-hour, during which time the hands and feet were icy cold, and at the same time there was severe sciatica; in the evening pressure over the liver and spleen caused no pain. The patient was able to take by the mouth cornflour, champagne, soda and brandy, as well as 30 grains of quinine and 5 grains of antipyrin; in the afternoon he had a refreshing sleep.

February 26th—Early this morning the patient perspired heavily after having had a good sleep; to-day he only passed 10½ fl. ounces urine, which was of a yellowish brown colour, felt very sick all day, but was able to take food well, and passed one large dark green motion; the only medicine taken to-day was 20 grains of quinine.

February 27.—The patient was very restless in the night and had a free perspiration, passed one large dark brown motion and at least 35 fl. ounces of straw coloured urine, sp. gr. 1020; able to take slops and iced jelly, he also took and kept down one wine glass of brandy and two of hock.

February 28th.—Had a good night and felt much better, the jaundice much less, and he was rapidly improving, had passed 38 ounces urine in 24 hours which did not contain any albumen. The patient took 10 grains of quinine to-day.

February 29th.—No pain in liver, spleen or kidneys; and the spleen which had been slightly enlarged was becoming smaller; the patient felt languid and weak but otherwise well; to-day he took 5 grains of quinine, also arsenic and peruvian bark in chloroform water.

March 1st.—Temperature and pulse normal, patient improving rapidly, the jaundice had quite left him, and he was passing urine more freely.

March 7th.—After a short walk, it was noticed there was some œdema of both ankles, this being probably due to his anæmic condition; to take digitalis and iron. The urine containd neither albumen or bile.

In this case there was little or no vomiting, and the urine was at first alkaline; the patient was always able to take food and medicine by the mouth. I extract the following note from the report of this case: "The patient besides having a good constitution takes proper care of himself, lies up when he begins to feel ill, and takes his medicine well and regularly, he is of a cheerful disposition, and, as a rule, is able to take his food well, and he always covers his head properly when he has to go out during the heat of the day."

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Case 11.—March 15th.—A—— B—— had been feeling rather unwell since yesterday, he was restless last night and sweated freely. The urine was acid and rather high coloured. At 12 noon the patient had a slight rigor; at 2 p.m., as he felt very hot, 10 grains of antipyrin were given, this produced rapid and free perspiration. During the day he took 30 grains of quinine and a purgative. His tongue was moist and furred and he was rather restless; at night he had a soothing draught containing 30 drops laudanum.

March 16th.—The soothing draught was followed by a refreshing sleep; at 3 a.m. there was a slight rigor, the temperature at that time being 99·4. The bowels acted freely. As the patient complained of some pain in the region of the kidneys, a mustard plaster was applied. Pain over the spleen; patient slightly jaundiced; he felt rather sick and weak. At about 5 p.m. he was very hot and uncomfortable; the pulse which had been 80 in the morning, rose to 120; the temperature being 101·5; in a short time a free perspiration broke out, and at 8 p.m. the temperature and pulse were normal. Only 10 grains quinine were administered to-day.

March 17th.—One light coloured yellow motion passed; the urine of a dark brown colour, sp. gr. 1013, contained bile but no albumen or blood. The patient felt rather weak, but otherwise quite well; 15 grains of quinine were given to-day.

March 18th. Patient anæmic, complained of feeling his heart beating; 10 grains of quinine were given.

March 19th.—Hardly passing enough water, but perspired freely and the bowels were rather loose, the motions being watery.

March 21st.—Convalescent, taking a tonic. From this time, he rapidly improved.

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CASE 12.

(*See Chart, Case* 12.)

MALARIAL FEVER WITH BLACKWATER SYMPTOMS. RESULT : RECOVERY.

—A —— B——, European, very moderate drinker, had lived in Africa about two years and had several attacks of fever. To-day he returned from a long canoe journey and reported that he had fever for three days; he said his urine was of a dark colour for twenty-four hours. His temperature on the evening of the 19th was 101·4; he took 20 grains of antipyrin; there was some bilious vomiting.

June 20th.—The patient was jaundiced; did not vomit, urine dark red in colour and contained a large amount of albumen and hæmoglobin. A purgative was taken and the bowels were well opened, urine rather scanty.

June 21st.—Had a restless night; there was less jaundice; the urine was secreted more freely and was normal in colour. The patient rather drowsy all day.

June 22nd.—Complained of headache; urine free and plentiful, bowels well opened; the patient much better.

June 23rd and 24th.—Much better, bowels freely opened, patient very drowsy.

June 25th.—Now convalescent, the urine contains no albumen.

June 27th.—Much better; is taking iron and nux vomica.

The patient after his fever, complained of nearly total blindness in one eye; this cleared off in a few days.

During this attack, there was only slight pain over the liver and spleen, and there was little or no vomiting, the temperature never reached 104, and the pulse and respiration kept about normal. The urine rapidly cleared, but it is uncertain how long blood pigment had been present.

The patient took 60 grains of antipyrin and 85 grains of quinine.

CASE 13.

Blackwater Fever. Result: Recovery.

A—— B—— says he has had two attacks of blackwater fever; the second was very slight and he had no medical care while it lasted. In all probability this second attack was one of malarial hæmaturia—his first attack has been reported (see case 12.)

January 18th.—Has felt unwell for two days. Jaundice marked, respiration hurried; urine looked like stout, reaction neutral, threw down a light coffee brown sediment which measured about ⅙th of the whole, the fluid above this sediment was dark red in colour, contained ½ albumen.

12 noon, temperature 104·5, pulse 122, respiration 36, urine sp. gr. 1018. Liver and spleen tender on pressure, but not perceptibly enlarged. Patient felt hot and uncomfortable, 15 grains of antipyrin caused a free perspiration. A purgative and 20 grains of quinine were administered. Vomiting not severe. Evening, temperature 100·6, pulse 86, respiration 15.

January 19th.—Had had a restless night; vomited once; the bowels freely opened. Felt rather better. The spleen now reached 3 inches below costal margin and was rather painful. A sufficient quantity of urine not passed. Dr. Smith made a careful microscopical examination of the urine, and found much granular detritus, some casts and uric acid crystals, and, here and there, a few blood cells.

10 a.m., the urine was rather lighter in colour and contained more blood cells than the last specimen. No bile detected in the urine. The patient vomited his medicine, the vomit was bilious in character and only slightly green. In the evening, the urine had become still lighter coloured and only contained ⅛th albumen; the

patient twice vomited greenish matter; was able to take some food by the mouth.

Morning temperature 100, pulse 90, respiration 19; evening temperature 102, pulse 116, respiration 17.

January 20th.—Had a good night and felt rather better, bowels freely opened during the night; vomited twice; urine lighter in colour, sp. gr. 1015, acid and contained only a trace of albumen. Complained of pain in the spleen and liver.

Morning temperature 99·8, pulse 93, respiration 20; evening temperature 102·7, pulse 109, respiration 19.

January 21st.—Felt very weak, but improving; no vomiting; nose bled this afternoon; the spleen is smaller; there was a good deal of singing in the ears, probably due to the quinine.

Morning temperature 99·6, pulse 94, respiration 16; evening temperature 103·2, pulse 112, respiration 19.

January 22nd.—No abdominal pain; the spleen barely perceptible.

Morning temperature 99·9, pulse 96, respiration 16; evening temperature 101·4, pulse 102, respiration 24.

January 23rd.—The patient felt much better, but suffered a good deal from headache.

Morning temperature 100, pulse 99, respiration 18; evening temperature 101·3, pulse 98; respiration 19.

January 24th.—Morning temperature 100·2, pulse 96, respiration 15; evening temperature 100·5, pulse 92, respiration 28.

The bowels were well opened and the patient felt much improved.

January 25th.—Complained of headache all day, bowels opened, urine straw coloured. In the evening became very feverish.

Morning temperature 100·5, pulse 84, respiration 22 evening temperature 104·4, pulse 124, respiration 28.

January 26th.—This morning said he was much better, but became decidedly worse towards the evening, the pulse being weak and irregular.

Morning temperature 99, pulse 90, respiration 20.

5 p.m., temperature 106·3, pulse 141, respiration 35.

7 p.m., temperature 105·6, pulse 134, respiration 32.

9 p.m., temperature 103.

Quinine and antipyrin were given freely, and stimulants were administered; at night the patient's condition had improved, but he did not pass enough urine.

January 27th.—Morning temperature 100·4, pulse 102, respiration 22.

3 p.m., 104·4, pulse 150.

Evening temperature 101·8, pulse 90, respiration 19.

Urine sp. gr. 1013, acid, contained a trace of albumen, but no blood.

January 28.—Morning temperature 100·7, pulse 110, respiration 21.

4 p.m., temperature 103·4, pulse 129, respiration 29.

Evening temperature 102·3, pulse 120. The patient felt better, there was some epistaxis to-day. Complained of headache caused by the quinine.

January 29th.—Morning temperature 101, pulse 126, respiration 22.

Evening temperature 102 6, pulse 120.

January 30th.—Morning temperature 101·9, pulse 120, respiration 24.

Evening temperature 102·2, pulse 136, respiration 43.

The patient was in an extremely weak condition, and in the night was light-headed.

January 31st.—Morning temperature 101·9, pulse 120, respiration 35.

Evening temperature 101·9, pulse 123, respiration 34.

The patient slightly better but very drowsy.

February 1st.—Morning temperature 100·4, pulse 129, respiration 32.

Evening temperature 100·7, pulse 138.

The patient rather better, now passing urine much more freely; still very drowsy.

February 2nd.—Morning temperature 99·7, pulse 118. From this time the patient began to improve in every way; he was able to take his food and medicine without discomfort, the drowsy feeling passed off, and urine was secreted freely. The temperature kept a little above normal till the morning of February 5th, and on that day iron and arsenic were ordered.

During this attack the patient was fed constantly, and took a large amount of quinine as well as some antipyrin.

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CASE 14.

BLACKWATER FEVER; FIRST ATTACK. RESULT: RECOVERY.

A—— B——, 22 years of age, had lived in Africa for nine months; very anæmic and had had five sharp attacks of fever.

September 15th.—Patient suffering from chilliness, nausea, headache, and numbness of the feet; the temperature at one p.m. being 100, it rose rapidly to 105; antipyrin produced free perspiration and lowered it to 100. The urine at night was high coloured.

16th.—The patient had a restless night; no perceptible enlargement of the liver or spleen, but some tenderness on pressing over the spleen. Bowels moved—stools bilious; persistent bilious vomiting. About noon the patient became jaundiced, and the jaundice rapidly became intense. The urine became of a dark chocolate color and contained ½ albumen; on examination also found to contain bile pigment and a few red blood cells, some perfect, and some in various stages of disintegration. 8 p.m. The patient had been drowsy, the skin was moist, and the jaundice deeper; bowels well opened, motions dark and bilious; frequent bilious vomiting.

17th.—Chloral gave the patient two hours sleep, but later he became very restless, skin acting well and the jaundice less. The tongue was covered with moist fur of a brownish yellow colour. The urine passed freely, claret coloured, contained $\frac{1}{4}$ albumen, some blood cells, bile, urates and hyaline casts. Some præcordial pain and oppression.

6 p.m.—Had a fairly comfortable day; little or no vomiting, the urine was of a lighter colour.

18th.—In the early morning patient again complained of nausea and epigastric uneasiness. Bowels acted : the stools were of a light yellow colour. Jaundice less, the urine bright red in color, contained a few stray corpuscles and 1-10th albumen.

From this date the patient improved rapidly, so that on the 26th he was practically well.

The patient took altogether 75 grains of quinine and 20 of antipyrin; he also had each day a mixture containing digitalis, liquor ammonii acetatis and spiritus ætheris nitrosi. No stimulants were required; barley water was given *ad libitum.*

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CASE 15.

BLACKWATER FEVER; SECOND ATTACK. RESULT: RECOVERY.

A—— B——, whose case was last noted (case 14) had, in the following December, another severe attack of fever.

December 13th to 15th.—The patient had been taking quinine every night for ague, which came on about 6 a.m. each day.

December 16th.—Had the usual attack of ague, and there were the premonitory symptoms of fever—vomiting, chilliness, &c. The morning temperature rose to 104·2, and 20 grains of antipyrin were given. The eyes and skin had an icteric tinge. At 2 p.m., the patient voided bright red coloured urine, which contained $\frac{1}{8}$ albumen and a few broken down blood cells; but there was no bile pigment present. There was nausea and sharp epigastric pain, but no noticeable enlargement of the spleen or liver. Profuse sweating relieved the nausea; the motions dark and fœtid.

17th.—The patient had a fairly good night; no urine passed from 2 p.m. yesterday till 7 a m. to-day, it was of a dark red colour. The jaundice much less; there was anorexia and nausea, but no vomiting. The temperature was normal all day.

18th.—No jaundice; the urine normal; and the temperature 98·4 all day.

19th.—Rigors and vomiting in the early morning. Temperature rose to 103, and 20 grains of antipyrin, were given. Pain on pressing in the hypochondriac regions; the left lobe of the liver enlarged, and there was some jaundice; the urine high coloured, but does not contain albumen, bile or blood.

20th.—From this time the patient improved.

During the attack, 120 grains of quinine and some antipyrin were given.

CASE 16.

BLACKWATER FEVER. RESULT: RECOVERY.

A—— B——, a strumous subject, this was his first visit to Africa; he had suffered a good deal from exposure and had had several attacks of fever.

For some days he had had the usual remittent fever, the temperature for the last three days ranging between 101 and 104.

During the third night while the patient was delirious he walked out in the rain, and caught a severe chill.

4th day —Morning temperature 104·2. Icterus marked. Skin hot and dry, tongue covered with foul white fur, persistent bilious vomiting, some pain over the liver, patient slightly delirious. At noon the urine became of a dark dirty red colour; it contained ¼ albumen, and some broken down blood cells, but no bile pigment was present.

5th.—Bowels acted freely, urine lighter in colour, and the icterus is less marked.

From this time the patient improved, the icterus cleared up by the 8th, but there was still a trace of albumen.

Antipyrin was given occasionally; 25 grains of quinine were administered from 1st to 5th day, and 10 grains daily after 5th.

It is possible that the urine was red earlier than the 4th day; most likely it came on almost directly after the exposure on the 3rd night.

CASE 17.

(See Chart, Case 17.*)*

BLACKWATER FEVER (FIRST ATTACK) RESULT : RECOVERY.

A—— B—— aged 22 years; first voyage; had been on the West Coast of Africa about 18 months. Health had been indifferent, was anæmic and had had many fevers.

April 22nd.—Had not felt well for two weeks, had several slight attacks of fever, relieved by the usual treatment; been taking a pill containing arsenic and iron.

April 23rd.—Suffering from fever, and looked sallow and anæmic; had the usual symptoms—vomiting, &c.; temperature varied from 99 to 101·2.

24th.—Morning temperature 99, evening 102·1.

25th.—Restless night with occasional vomiting; morning temperature 103·2; skin hot dry and jaundiced; tongue has whitish yellow coating, clean at the tip; persistent bilious vomiting. Patient took two pills containing calomel and colocynth, he also took 10 grains of antipyrin and a draught containing spiritus ætheris nitrosi. Urine high coloured, but otherwise normal; at noon urine almost black and contained ½ albumen, both bile and blood pigment detected. In the evening complained of numbness of extremities, and hepatic and splenic uneasiness; applied mustard plaster over liver. A draught of bromide of potassium and chloral was given at night.

26th.—Morning temperature 101, had very restless night; was delirious; the bowels opened twice, urine passed freely: contained bile and a few blood corpuscles; vomiting persistent, nothing retained by the stomach; dry brown fur on tongue; vomit watery and contains greenish shreds. Later, kept down some eggs and brandy. A mixture containing nitro-hydrochloric acid was given; dilute prussic acid, creasote and effervescing mixtures were all returned; jaundice very deep, almost green.

11 a.m. An enema of quinine gr. 20 and beef tea administered with the long tube, but returned almost at once.

Noon. Temperature normal; pulse 126 and dicrotic; persistent delirium; the patient took 2 fl. ounces of champagne every two hours, and essence of beef every hour.

2 p.m. Calomel gr. iii, controlled vomiting for about one hour, but it then returned as bad as before. Gave rectal injection of hot water.

6 p.m. Temperature 100, dosed for two hours; skin dry, nourishment in small quantities not rejected so frequently.

8 p.m. Sulphonal 20 grains given, but was vomited in ten minutes.

27th.—The patient had no sleep through the night, was restless, irritable, and delirious; urine contained ½ albumen; bowels acted twice in night. Pulse feeble and intermittent, patient complained of palpitation; there were sordes on teeth, the tongue dry, brown and furred, and there was considerable hepatic tenderness.

Tepid sponging with nitro-hydrochloric acid in bath, repeated three times in the day.

A pad of lint containing diluted nitro-dydrochloric acid was kept over the liver.

Patient took champagne every half hour, and essence of beef every hour, nothing else given by the mouth.

Tongue dabbed with borax and glycerine.

At noon a hypodermic injection containing morphine and atropine was followed by two hours sleep.

20 grains of quinine given by the rectum were retained; profuse greenish vomiting.

28th.—Extremely restless; the hypodermic injection was repeated and followed by four hours sleep; skin moist, and there was less jaundice; tongue moistening at the tip, sordes disappearing, vomiting less.

The pulse is firmer and has lost its dicrotism; urine contained albumen, bile, and blood. The liver pad and acid sponging were repeated; champagne and beef essence retained; nothing else given by the mouth. Gave a rectal injection of hot water, followed by one containing 20 grains of quinine.

29th.—Fairly good night, vomited once. No sordes on teeth, tongue still dry and brown; bowels well opened, stools bilious, pulse improving, jaundice less, no delirium. Acute epigastric pain, both spleen and liver tender on pressure, percussion shewed no enlargement; patient extremely feeble. A mixture containing dilute nitro-hydrochloric acid was given. To take some brandy and small quantities of chicken broth.

30th.—Had fairly good night; the tongue moist and cleaning at edge and tip, no vomiting; jaundice rapidly disappearing, there was bilious diarrhœa through day.

Urine of strong tea colour and contained a trace of bile.

May 1st.—Diarrhœa continued, pulse dicrotic, and there was a loud systolic bruit over the pulmonary area; the patient complained of occasional palpitation; the jaundice had disappeared, and the urine contained a trace of albumen, but otherwise normal; anæmia marked.

The patient now recovered slowly and was invalided home.

Notes by Dr. WHITTINDALE.—The vomiting was very troublesome, drugs were found to be of little use at first Insomnia became serious, and morphine had to be used.

The distressing thirst was much relieved by the injection of warm water.

The acid sponging and the liver pad seem to have done good.

CASE 18.

Blackwater Fever (First Attack). Result: Recovery.

A—— B—— admitted January 13th; 23 years of age, of temperate habits and sound constitution. This was his first visit to West Africa, he had been out about two years, during which time he had several not very severe attacks of fever, and one attack of dysentery, in consequence of which he had become decidedly anæmic. He attributed this, his first attack of blackwater fever to exposure to the sun on the 12th while suffering from a mild attack of fever.

Jan. 13th.—Patient felt unwell yesterday, but went out to inspect one of the plantations, at 5 p.m. his temperature was 102·8, and he took 10 grains of quinine, he had previously taken 4 grains, and said he had vomited three times.

At 7 a.m. this morning, patient felt very ill, and was jaundiced, his urine was a bright yellow colour. 9 a.m., had vomited several times, the vomit being of a bright green colour. Passed 9 ounces urine, dark red colour, sp. gr. 1010, slightly alkaline and containing albumen. 5 p.m., patient passed some more dark red urine, which gave a thick chocolate like deposit, sp. gr. 1015, reaction acid. Up to the present he had retained 20 grs. of quinine. Headache severe, spleen extends 2½ inches below the ribs. He had now taken 10 grains of antipyrin.

About 8 p.m. he took some iced milk which was rejected immediately; felt extremely prostrate; champagne made the vomiting worse. Patient did not complain of pain in back, spleen or liver, was markedly jaundiced, but did not see objects yellow; his hands and feet were cold and he was perspiring heavily; vomited a great deal, and was drowsy all day, the bowels well open.

14th.—6 a.m., had a very restless night, and vomited a good deal, taking liquor bismuthi et ammonii citratis. Passed acid urine, sp. gr. 1020. Still rather collapsed. 12 noon, passed lighter coloured urine, sp. gr. 1017, which gave a thick deposit of a dirty bath brick colour. Tongue moist and furred, and has a circular black patch behind the tip towards left side. 9 p.m., had vomited a great deal, and passed four dark yellow coloured motions. The urine now much lighter, there was less deposit and less albumen, sp. gr. 1020.

Patient not nearly so drowsy, jaundice much less; he was rather better to-night, but I had to give an opiate as he was very restless.

15th.—Patient very ill all day, vomited a good deal, urine much lighter, bowels well open. Besides quinine he took tincture of iron, which certainly seemed to do good.

16th.—Had a fairly good night, the vomit which had varied from a bright to a dirty green colour was now yellow; his condition was generally favourable; the urine which still contained albumen was quite clear, sp. gr. 1010.

From this time the patient gradually improved; the amount of urine passed was satisfactory, on the 26th it contained no albumen. The convalescence was rather protracted owing to slight continued fever.

While very ill he was fed on slops; when these could not be retained nutrient enemata were given.

Quinine was given freely every day, but very large doses were not considered advisable, as there was a great tendency to collapse, and the temperature was not high; for the same reason very little antipyrin was given.

Ice, champagne, soda, subnitrate of bismuth, opium, &c., were administered to check the vomiting, and a mustard plaster was also applied over the stomach.

It is remarkable how little pain there was, the liver can only have been enlarged to a slight extent as it was barely perceptible below the ribs.

It is to be noted that the urine was alkaline on the morning of January 13th, and though it was scanty there were never any marked signs of suppression.

January 12th.—E.T. 102·8.
January 13th.—7 a.m.—T. 102·8.
9 a.m.—T. 103·6. P. 104.
2 p.m.—T. 102·6.
5 p.m.—T. 103·4.
8 p.m.—T. 100. P. 106.
January 14th.— M. T. 99·2. P. 106. R. 13.
E. T. 99. P. 104.
January 15th.— M. T. 98. P. 80.
E. T. 98·4. P. 80.
January 16th.— M. T. 98. P. 80.

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CASE 19.

(*See Chart, Case* 19.)

Blackwater Fever (First Attack). Result: Recovery.

A—— A——. European lady had resided in West Africa about two years; her general health had been unsatisfactory, was anæmic and had several attacks of fever.

January 26th.—Patient said she was very ill yesterday; constipated; urine porter like, and contained blood colouring matter, skin yellow. A purgative was at once given, antipyrin (20 grains) lowered the temperature. P. 92. R. 30.

27th.—Improving; urine sp. gr. 1015; neutral. P. 92. R. 15.

28th.—Felt much better; urine still very dark. P. 84.

29th.—Patient improving; urine amber coloured; sp. gr. 1018; it did not contain either blood or albumen.

30th.—The patient now much better.

February 3rd.—Was convalescent.

This patient only had a moderate amount of vomiting and the urine was neutral instead of being very acid, as is often the case. Up to January 31st she had only taken 80 grains of quinine.

There was in this case little or no tendency to suppression of the urine.

CASE 20.

ACUTE MALARIAL POISONING. RESULT: DEATH.

A——B——, a delicate and anæmic man, had had several attacks of fever, and suffered from considerable enlargement of the spleen.

January 30th. 6 p m., temperature 105·4, pulse 118. Patient said he had had fever for two or three days.

31st.—Morning temperature 104·6.

2·30 p.m., the patient is said to have been seized with convulsions at 1·30 p.m.; now unconscious, eyes fixed and staring, conjunctival reflex present, jaws clenched, lips twitching; being unable to swallow, medicines were given by the rectum.

The temperature rapidly rose from 108·8 to 110·3 and the patient died comatose. Just before death the face and body became markedly congested. It is reported that the patient had not been out of doors for five days.

CASE 21.

Acute Malarial Poisoning. Result: Death.

A—— B——, European. The patient had had several attacks of fever; this was his first visit to Africa, had always been considered to be healthy, but was said to have had convulsions when a child. Very anæmic.

April 26th, morning, said he has had slight fever for two days, but as he now felt quite well he proposed to go for a long canoe journey the next day; 4 p.m., said he had been very ill for about an hour, was almost suffocated by the heat, and felt as if about to have a fit, temperature 104·6. Purgative and other medicines given. 7 p.m., had epileptiform convulsions, and then passed into a comatose condition. Pupils rather small and insensible to light, conjunctival reflex gone, breathing laboured and hurried; pulse full and quick at first, afterwards rapid and small, some twitching of the hands. Temperature 108, wet pack given and a rectal injection administered, the temperature rose to 109·2 and then fell to 108; the patient died at 11·30 p.m.

CASE 22.

Malarial Fever. Result: Recovery.

A—— B——, healthy European, admitted January 5th. Had had fever for two or three days, and now felt very ill. Vomited a good deal; complained of hepatic and splenic pain, urine contained no albumen.

Jan. 6th.—There was no morning remission noted. The temperature rose to 104·2, and the respiration caused some anxiety as it became very hurried. Patient very ill all day, inclined to vomit; iced drinks given.

Jan. 7th.—Still feverish, but feels much better.

Jan. 8th.—Patent improving, left for his station, and at night felt quite well.

While under treatment, he took 65 grains of antipyrin, and 90 grains of quinine.

January 5th.—8 p.m.—T. 103. P. 96.
January 6th.—8 a.m.—T. 103. P. 90.
3 p.m.—T. 104·2
8 p.m.—T. 103·2. P. 96. R. 34.
January 7th.—8 a.m.—T. 101·2. P. 80.
3 p.m.—T. 103.
8 p.m.—T. 100·4. P. 80.
January 8th.—8 a.m.—T. 100.

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CASE 23.

Malarial Fever. Result: Recovery.

A—— B——, European, had suffered from several attacks of remittent fever.

Began to be ill on the 29th January. Quinine was administered freely, the amount is not noted—the medical officer was ill.

February 1st.—Antipyrin had to be given to produce sweating, as the skin kept hot and dry; almost immediately after taking 20 grains of this drug, he began to improve, perspiration, which had been scanty, became free, the pulse, which had been 90, became slower, and the patient who had been feeling very ill, was able to sit up for four hours.

At night, he begged for more antipyrin, as he said it always sent him to sleep. Some pain over the liver and spleen; albumen not present in the urine.

About noon on February 2nd, he began to feel very unwell again, and the skin was very hot and dry. Antipyrin was again given; it was quickly followed by perspiration, and from this time the patient improved rapidly.

February 1st.—Took 30 grains of quinine, and 30 of antipyrin.

February 2nd.—Took 30 grains of quinine, and 25 of antipyrin.

February 3rd. - Took 30 grains of quinine.

February 4th. – Took 25 grains of quinine.

February 5th.—Convalescent; taking arsenic, iron and nux vomica.

January 30th.—E. T. 103·2.
January 31st.—M. T. 101·0.
E. T. 103·6.
February 1st.—M. T. 103.
February 2nd.—M. T. 99·5.
E. T. 100·8.
February 3rd.—M. T. 100.
E. T. 99·8.

CASE 24.

Malarial Fever. Result: Recovery.

A—— B——, European, arrived in West Africa at the end of January.

Said he had been ill off and on, ever since February 7th.

About February 17th, was confined to his bed for nine days as he had severe fever; after this attack he never felt quite well, and had to lie down for a time each day.

March 8th.—Began to feel very unwell, had fever almost constantly but managed to do two hours work every day.

For the first three days he took 10 grains of quinine, after that, as he felt inclined to vomit he did not take any. He said that ever since his first fever his urine had been high coloured, lately it had been "quite dark," and he thought not sufficient in quantity.

March 19th.—The patient delicate and anæmic; extremely weak; staggered when he walked; pulse very feeble; he had never been a strong man. Thick fur all over his tongue, and black band down the centre; breathing asthmatic in character; thought he had asthma before. Iced jelly given, as he was vomiting a good deal. He was feeling very ill, weak and restless. Took 10 grains of quinine. Dilute hydrocyanic acid and laudanum were given to him at night, and after the draught he had his first peaceful night since he began to be ill. 3 p.m., temperature, 102·8; 8 p.m., temperature 103·8, pulse 100.

20th.—Took and kept down 20 grains of quinine; he also retained some champagne and iced jelly. Morning temperature normal; evening temperature 101·1, pulse 90. Slight enlargement and tenderness of the spleen and liver; said he had pain in the right iliac fossa. At night, he became rather light-headed, imagined there were crowds of people in his room; had not vomited at all to-day; soothing draught repeated.

21st.—Patient rested well last night, and now felt rather better than he had done for several days. Very weak, and pulse feeble. Took 15 grains of quinine. Morning temperature 99·4, pulse 100. Urine contained no albumen; sp. gr. 1025. Less uneasiness about the abdomen; spleen and liver are both enlarged. Towards evening the patient became decidedly light-headed; passed one or two motions which had a dysenteric appearance; tongue very dirty but cleaning. At night, a draught containing opium catechu and ginger given. Evening temperature 99·4, pulse 90.

22nd.—Patient decidedly better. Took 10 grains of quinine and took food twice; passed two motions which I did not see. In the evening the draught was repeated. During the day there had been no vomiting. Morning temperature 99·4, pulse 76.

23rd.—The patient now rapidly improved; each day he took quinine and a mixture of dialysed iron and nitro-hydrochloric acid and chloroform. Morning temperature 98·2, pulse 70.

On the 26th, he returned to his work, the temperature having been normal for two or three days.

During this fever, the patient did not take much quinine. I believe that his rapid recovery was in part due to the opiate given.

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CASE 25.

(*See Chart, Case* 25.)

MALARIAL FEVER WITH BLACKWATER SYMPTOMS: RECOVERY.

A—— B——, European, had been in West Africa before. The patient reported he had not been feeling well for some time; about a month ago had an attack of fever—followed 10 or 12 days later by a second attack; after this had passed off he had a very long canoe journey and got wet several times.

May 1st.—Went out for a ride; noticed pain over the kidneys.

2nd.—Felt unwell all day.

3rd.—In the evening temperature rose to 101 and he felt sick.

4th —Severe bilious vomiting.

5th.—Felt better, but had to lie down about noon, and at 3 p.m. his water became bloody, and he felt very feverish. He said that when on the coast before, he often noticed that his urine was bloody, and that after a few hours it would clear up.

6th.—Present condition: face haggard, icterus especially of the conjunctivæ well marked, the liver extends 1 inch below the costal margin, slight pain over kidneys but no appreciable enlargement of the spleen; tongue furred, respiration laboured, and urine deeply blood coloured, bowels rather loose. During the day the patient vomited but not severely; the tendency to vomit seems to have been greatly reduced by the application of a large mustard plaster to the abdomen; quinine had to be given by the rectum, but soda and milk were retained by the stomach.

Evening.—Dry cupping was performed over the kidneys; was some vomiting but not severe, there being at times a little bright blood in the vomited matter. Dovers powder given at night Took 20 grains of quinine to-day. Pulse 112 to 108, respiration 21 to 32.

May 7th.—Vomited several times during the day, the vomit, which was bilious at times, contained blood. The icteric colouring very marked; the urine still bloody, becoming towards evening less dark. During the day the patient was fed per rectum, quinine being given in the same manner, and he drank some champagne and soda water; tongue less furred, but browner down the centre. Took 15 grains of quinine to-day. Pulse 120 to 132, respiration 24 to 28.

May 8th.—The patient improved slightly to-day. The icterus about the same, the urine only slightly bloody, bowels well opened; occasional vomiting. During the day the patient took a good deal of champagne, at night as he was restless sulphonal was given. Took 15 grains of antipyrin to-day. Pulse 110 to 116, respiration 21 to 26.

May 9th.—Still getting better; took champagne, beef tea, soda and milk, &c. The urine only slightly high coloured; the patient was dry-cupped over the liver to-day. In the afternoon his voice became rather indistinct and he was somewhat incoherent in his talk. Took 10 grains of quinine. Pulse 100, respiration 22.

May 10th.—Quieter and more collected, and better in himself, nearly all day the temperature was subnormal. Took 10 grains of quinine. Pulse 100, respiration 22.

May 11th.—Icterus less, tongue moister, but still brown and rather dry down centre. Took 5 grains of quinine.

On the whole the patient much better this morning; at night he was *very* drowsy.

The patient from this time gradually improved, at times he had some return of fever. May 13th his spleen was enlarged, but the liver was normal. On May 18th he was stronger and could walk a little; there was still some icterus.

In this case it was not possible to examine the urine microscopically, but there can be no doubt, I think, that this was a case of hæmoglobinuria.

CASE 26.

Malarial Fever. Result: Recovery.

A—— B—— an intelligent European reported his own case as follows:

"I have been 18 months in Africa—have always been a healthy man—I have never had blackwater fever before, but I have had several attacks of ordinary malarial fever. I attribute the attack which I am now reporting to my sleeping on the banks of the river in the open; I woke up dripping, felt unwell for three or four days, and was then taken with violent shivering which lasted for three or four hours. I had severe shivering and vomiting off and on for about three days; water became black on the second day of the shivering, I had been jaundiced for for some hours before I noticed this. My vomit was very green in colour, and my water was scanty and came in driblets. I took quinine and antipyrin, and during the time I was very ill, I only swallowed a little corn flour and a mild saline purgative in addition to the antipyrin and quinine. I had fever for ten days and I was not fit for anything for three weeks. I suffered while ill from pains in the back and limbs."

In the following July the same patient felt ill for two days, and on the third day he had severe ague, his water at the same time becoming nearly black. Only had about four hours vomiting and was about again in a week. He said he had slight jaundice, but that his vomit was not green in colour.

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